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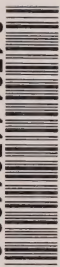
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Challenges to Deterrence: Doctrines, Technologies and Public Concerns

A Conference Report
by
Dianne DeMille

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Proceedings of the Conference
on
Challenges to Deterrence

Ottawa, 17-19 October 1985

The Canadian Institute for International Peace and Security was established by Parliament on 15 August 1984. It is the purpose of the Institute to increase knowledge and understanding of the issues relating to international peace and security from a Canadian perspective, with particular emphasis on arms control, disarmament, defence and conflict resolution.

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PROGRAMME
17-19 October 1985

Conference on
"CHALLENGES TO DETERRENCE: DOCTRINES
TECHNOLOGIES, AND PUBLIC CONCERNS"

THURSDAY, OCTOBER 17

Keynote Address

Speaker: **The Right Hon. Denis W. Healey**

Chairperson: **William Barton**

FRIDAY, OCTOBER 18

Working Session A (morning) Arms Control Issues at Geneva

Paper: **Alton Frye**
Council on Foreign Relations,
Washington, D.C.

Commentators: **Oleg N. Bykov**
Deputy Director,
Institute for International
Economics & International Relations,
Moscow

Wolfgang Behrends
Ambassador of the Federal
Republic of Germany,
Ottawa

William Epstein
Special Fellow
United Nations Institute for
Training and Research,
New York

Chairperson: **Harriet Critchley**

Working Session B (afternoon) The Technology of SDI

Paper:

Gerold Yonas

Acting Deputy Director
Strategic Defense
Initiative Organization,
USA

Commentators:

John Pike

Associate Director for Space Policy
Federation of American Scientists,
USA

Richard Garwin

Center for Science &
International Affairs,
Harvard University

Charles Thomas

Deputy Assistant Secretary,
Department of State,
USA

Chairperson:

Stuart Smith

Joint session with the Canadian Council on International Law:

Star Wars and Beyond: Nuclear Weapons and International Law

Abram Chayes

Professor of International Law,
Harvard University

W.M. Beckett

Formerly Director of
Nuclear and Arms Control Policy,
Department of National Defence

Judge Maxwell Cohen, Q.C.

University of Ottawa

Chairperson:

Geoffrey Pearson

Evening Address

Speaker: **Hon. Harvie Andre, M. P.**
Associate Minister,
National Defence

Chairperson: **John Claydon**

SATURDAY, OCTOBER 19

Working Session C (morning) Strategic Defence Issues in Canadian-American Relations

Paper **Lawrence Hagen**
Canadian Centre for Arms
Control and Disarmament

Commentators: **Albert Legault**
Professor of Political Science,
Laval University

Albert Carnesale
Professor of Public Policy and
Academic Dean at the J. F. Kennedy
School of Government,
Harvard University

John Polanyi
Professor of Chemistry,
University of Toronto

Chairperson: **George Bell**

Plenary Session (morning) Citizens and Governments

Panel **Christopher Wren**
The New York Times

The Hon. Gérard Pelletier
Former Canadian Representative
at the United Nations

John Honderich
Toronto Star

Chairperson: **John Sigler**

Closing Lunch

Guest Speaker: **Thomas Niles**
Ambassador of the
United States of America,
Ottawa

Chairperson: **Gerald Wright**

INTRODUCTION

In October 1985 the Canadian Institute for International Peace and Security organized a conference on *Challenges to Deterrence: Doctrines, Technologies and Public Concerns*. The object of this conference was to consider the current debate over the continuing worth of deterrence, a concept which has been challenged, for differing reasons, from both the "left" and the "right". The programme was divided into sessions on the current nuclear arms control proposals in Geneva, the technology of strategic defence, the language of the Anti-Ballistic Missile (ABM) Treaty, Canada's role in the Strategic Defense Initiative (SDI), and the question of public access to information. Each topic was addressed by a panel and then discussed in a question and answer period by conference participants.

Members of the media, academics, representatives from non-governmental organizations, and government officials from Canada, the United States and Europe took part in the Conference which began with a keynote address by the Right Honourable Denis Healey, a British member of parliament (See Appendix I), and continued throughout the weekend of 17 to 19 October 1985. One session, dealing with SDI and the legal interpretation of the Anti-Ballistic Missile (ABM) Treaty, was co-sponsored by the Canadian Council on International Law. Some of the sessions were held off the record, meaning that members of the press were required to obtain permission from participants to attribute specific remarks to a given speaker. In this report remarks and discussions are organized by topic rather than by the chronological sequence of events. A list of the participants is given in Appendix III.

EXECUTIVE SUMMARY

Background

In his speech of March 1983, President Reagan announced his intention of moving US policy away from reliance on deterrence to the prevention of nuclear war. According to Reagan's new plan deterrence, the fear of "mutually assured destruction" (MAD), would be replaced by strategic defence and "mutually assured survival". The American public was presented with the vision of US scientists and engineers creating an invisible dome of protection over the entire population.

Almost immediately, other voices in the Administration began to qualify these remarks, stating that, in the short-term, strategic defence would actually *enhance* deterrence by protecting land-based Inter-Continental Ballistic Missiles (ICBMs) and other military targets. Thus began a major debate over the true nature of strategic defence and the value of nuclear deterrence.

Another "challenge to deterrence" comes from the changing technology of offensive weapons. Many critics argue that the major thrust in the development of new warheads and delivery systems is towards "counterforce" and war-fighting capabilities. These "qualitative" developments in the nuclear arms race may have accelerated tendencies in strategic doctrine towards developing options for waging nuclear war, rather than achieving its deterrence by the threat of massive retaliation.

Basic Issues

Will such technological advances and doctrinal shifts undermine the stability of the current standoff between the superpowers? How will strategic defence affect military planning, weapons deployment, and strategic stability? Will the deep cuts outlined in recent arms control proposals have any effect on the qualitative aspect of the arms race? The agenda for the conference included not only these strategic issues, but also the following questions: Does the Canadian public have enough detailed information to assess new arms control initiatives? If not, can "experts" find better ways to provide Canadian citizens and members of the media with adequate, up-to-date information?

Main Conclusions

Conference participants brought insight and experience to bear on the questions outlined above. Many participants acknowledged

that the fear of nuclear war had had a restraining effect on the actions of the superpowers over the last forty years, especially in the European Theatre. They were, however, disturbed by recent trends in both doctrine and weapons technology which might undermine the stability of deterrence. The Strategic Defense Initiative of the Reagan Administration was particularly worrying. Although the purpose of the new Ballistic Missile Defence (BMD) remains ambiguous, most participants agreed that a push for BMD would affect military planning, weapons deployment and strategic stability, profoundly and irreversibly. On balance, these effects would be negative. Each side would become more fearful of a first strike by the other side, military plans would need to incorporate more provisions for a rapid response to a surprise attack, deployment of more offensive weaponry and penetration aids would be required to overwhelm strategic defences, and the overall result would be less stability in East-West relations.

Optimism was expressed by some participants over the recent arms control proposals in Geneva. Deep cuts in strategic arsenals and in intermediate-range forces in Europe would not change the military equation but might contribute to a real reduction in tensions between the superpowers, but, for the reasons outlined above, SDI would jeopardize the possibility of reducing offensive weapons. Many participants urged renewed commitment to the ABM Treaty and support for a Comprehensive Test Ban and a ban on anti-satellite weapons.

The journalists, academics, and representatives from non-governmental organizations, who took part in the conference, agreed that Canadian government officials were often reluctant to inform Canadians about negotiations and informal agreements with the United States and other allies. Officials, along with academics and other "experts", were enjoined to make an effort to inform both Canadian citizens and members of the various media about defence and arms control issues.

Keynote Address

The keynote address was given by the Right Honourable Denis Healey, currently British Labour MP and formerly Secretary of Defence. (The full text is presented in Appendix I.) He said that he believed that the "post-war settlement in Europe would not have lasted forty years without the deterrent effect of nuclear weapons", but warned that new theories and new weaponry threatened the stability of the balance of power. He summarized the developments in nuclear doctrine, geopolitics, and weapons technology which

had taken place in the last forty years and warned against civilians who construct abstract theories about nuclear war. There were four areas which he considered to be particularly destabilizing: the development and testing of anti-satellite (ASAT) weapons, the forward-basing of missiles which results in much shorter warning times, the deployment of dual-capable cruise missiles, and the push for a defence against ballistic missiles. He urged that allies of the United States, such as Canada and Britain, should make an effort to influence American policy. "If America's allies ever reach agreement on a clear, collective view, they can nearly always swing the battle in Washington."

ARMS CONTROL ISSUES: CURRENT POSITIONS

I. Recent Shifts in American and Soviet Positions

At the first working session of the conference, the opening speaker was Alton Frye, of the Council on Foreign Relations, Washington, DC. He suggested that, at this point in history, the two leaders of the world's superpowers, Ronald Reagan and Mikhail Gorbachev, had an unprecedented opportunity to reverse the nuclear arms race. Mr. Frye cited a number of important shifts in the position of both superpowers which he believed warranted some degree of optimism for the Geneva negotiations.

President Reagan had campaigned in 1980 on the promise to restore the United States to a position of military superiority over the Soviet Union. In 1984, he reversed this position, acknowledging that neither side could gain a meaningful strategic edge. Furthermore, Frye argued, while the early negotiating proposals tabled by the Reagan Administration were patently non-negotiable, the Administration had moved toward greater flexibility, offering more realistic trade-offs.

The Soviet Union had itself undergone a number of changes in the recent past and these too were put forward by Mr. Frye as reasons for optimism. Gorbachev had emerged as a very capable leader, with a number of fresh initiatives to spur the arms control process. For example, the Soviet negotiators, moving from their original argument that SDI research was prohibited by the ABM Treaty, had recently acknowledged that this treaty did *not* ban SDI research. They had also stated that it was possible to define the boundaries of such research, admitting that some deployment of space-based surveillance might be acceptable, though certainly *not* testing of lasers or other beam weapons in space. The Soviet Union had also recognized openly the distinction between the arsenals of the superpowers and those of the "independent" nuclear powers: France, Britain, and China. Finally, the USSR had, for the first time, proposed its own formula for arms reductions.

The US and Soviet proposals were encouraging because genuine reductions in offensive forces might avert any destabilizing forays into strategic defence. It was important, however, that the complexities surrounding "third country" nuclear forces not be allowed to muddy the Soviet-American negotiations. The superpowers could not negotiate about the nuclear forces of other countries, but

neither could these independent arsenals be ignored. The issue must be addressed forthrightly. Mr. Frye suggested a formula to deal with this problem: after reducing to a specified level, the superpowers could ask that "third country" arsenals be kept to some fixed percentage of that level. If any third power deployed more weapons, exceeding that fixed percentage, the superpower targeted would be free to deploy an equivalent number of weapons. This provision, said Mr. Frye, would pave the way for serious negotiations with Paris, London and Peking.

Mr. Frye also pointed out that it was important to follow the established counting rules in order to expedite a treaty. It was encouraging that Moscow accepted the necessity of lowering both launcher limits and warhead totals. Under SALT I, bombers not equipped with cruise missiles were considered equivalent to single-warhead ICBMs. Under SALT II, a bomber carrying cruise missiles was deemed to be carrying 20 warheads and was counted as a MIRV* launcher. If these counting rules were accepted, and if the United States and the Soviet Union were serious about reducing nuclear weaponry, there was, said Mr. Frye, real hope for movement in Geneva.

2. Elaboration of Soviet Position

The following speaker, Oleg Bykov, Deputy Director of the Institute of World Economy and International Relations in Moscow, said that the Soviet Union had made significant contributions to the Geneva negotiations and that Gorbachev was committed to stopping "the baleful arms race." His presentation focussed on those aspects of the Soviet arms control proposal which were either "novel or controversial." The Soviet negotiators had proposed a ban on all space weapons, including anti-satellite (ASAT) weaponry and space-based ballistic missile defence (SBBMD).

The USSR had also proposed a 50 percent cut in all strategic weapons, which would mean "radical reductions" both in delivery systems (missiles and bombers) and in nuclear "charges" (warheads, gravity bombs, cruise missiles). The goal of this initial "deep-cut" would be a ceiling of 6,000 warheads on each side. Taking into consideration the obvious asymmetries in the arsenals of the two sides, the proposal allowed for choice in the configuration of each side's triad of strategic forces, setting a 60 percent limit on the number of warheads allowable within any one "leg" of the strategic

* MIRV = multiple, independently-targetable re-entry vehicles.

triad. This meant that, if the total number of warheads (or "nuclear charges") was 6000, then no more than 3600 of those warheads could be based, for example, on land-based ballistic missiles. The same would apply to aircraft-carried or submarine-launched systems, the other two legs of the triad. In this way, Mr. Bykov argued, there would be leeway for meaningful trade-offs.

The Soviet Union had called for a reduction in the superpowers' intermediate-range nuclear forces (INF). The Soviet Union had already reduced the numbers of SS-20 missiles targeted on Western Europe to the level of 243 launchers. This was the number of SS-20s in place *before* the recent series of Soviet "counter-deployments", undertaken, Bykov said, as a response to US deployment of Pershing II and ground-launched cruise missiles (GLCMs) in Europe. In return, the Soviet Union expected the United States to discontinue European deployment of these land-based missiles. Furthermore, the USSR had proposed a separate agreement with France and Britain over their "independent" nuclear arsenals.

Mr. Bykov argued that the reductions proposed by the Soviet Union would also address the qualitative aspects of strategic weaponry. The primary intention of the Soviet proposal was to reduce the dangerous and destabilizing weapons which had counterforce capabilities. He admitted that Soviet ICBMs represent a significant counterforce threat, but earlier US attempts to limit only land-based ICBMs were unrealistic. He noted that the D-5 SLBM (Trident II) would have a counterforce capability equivalent to the newest Soviet ICBM. Thus the new Soviet proposal, placing a ceiling of 3600 warheads on Soviet ICBMs and the same ceiling on US SLBMs, would, he said, take account of both sides' counterforce capability.

Regarding the airborne leg of the triad, Mr. Bykov admitted that US air-launched cruise missiles (ALCMs) could not be described as equivalent in counterforce capability to the Soviet and American ballistic missiles mentioned above. However, he argued that the ALCM did have some counterforce capabilities, namely, a high degree of accuracy and penetrability.

Because anti-satellite (ASAT) weaponry threatens critical orbiting components of the command, control, communications and intelligence networks (C³I) of both sides — systems which are essential to strategic stability — the Soviet Union was prepared to agree to a ban on all ASAT weapons along with other "space strike" arms.

Regarding space-based ballistic missile defence, if defensive systems were deployed by one side, said Bykov, they would be deployed by the other side and as a consequence, both sides would be forced to increase the size of their offensive arsenals. The result would be an overall decrease in international security for all nations. Thus, there should be a ban on all such systems. The Soviet Union was not in a position to "wait and see" on this issue, said Bykov. Unless there was a prompt reaffirmation of the ABM Treaty, and an agreement to ban the testing and deployment of space-based defence, the Soviet Union would be pressed to respond with appropriate countermeasures and a strategic defence system of its own; "We badly need an agreement," he said.

Mr. Bykov emphasized that, if testing and deployment of space-based systems were allowed, the first casualty would be the arms control process itself. "Star Wars" and arms control, he stated, are incompatible. "It's an 'either/or' situation, you can't have both."

3. American Response to Soviet Proposals

At the closing luncheon of the conference, Ambassador Thomas Niles outlined the official US response to the Soviet proposals at Geneva. He began by pointing out that, despite their terrible power and frightening capabilities, nuclear weapons might have been the key to peace between East and West since 1945. In their absence there might well have been a military confrontation between the United States and the Soviet Union. In his opinion, nuclear weapons had been the basis of deterrence ever since their introduction.

Washington believed that the new Soviet proposals were a response to continuing allied support and solidarity within NATO. In November 1983, the Soviet Union walked out of the Geneva talks and vowed not to return until the US ground-launched cruise missiles (GLCMs) and Pershing II ballistic missiles were removed from Europe. Yet, the talks had resumed. The Soviet Union came back to the table, said Niles, "because the Western Allies did not panic."

Ambassador Niles outlined the most recent American proposals at Geneva, emphasizing the elements of highest priority. President Reagan had called for "deep reductions" in the levels of offensive nuclear systems, proposing a cut in strategic ballistic missile warheads down to a limit of 5,000 on either side with ceilings on heavy bombers and air-launched cruise missiles. Within this framework, the United States was prepared to negotiate trade-offs allowing for differences in the two sides' force structures.

In the Strategic Arms Reduction Talks (START), the goal of US negotiating strategy was to strengthen the stability of mutual deterrence through "substantial, equitable and verifiable reductions in strategic forces below . . . the levels set in SALT II." Originally, in the Intermediate-range Nuclear Forces (INF) negotiations, the United States had called for "the complete elimination of US and Soviet longer-range, land-based INF missiles." However, since the Soviet Union rejected that proposal, the United States had indicated a willingness to agree to equal ceilings, on a global basis, on intermediate-range nuclear forces.

The third component at the Geneva talks was the area of space-based defence systems. Ambassador Niles said that the United States was prepared to discuss the full range of issues related to space weaponry, including the "offence-defence relationship." The United States would like to move away from deterrence based exclusively on retaliation with offensive nuclear forces, and the security of both sides could be enhanced by reducing offensive weapons and increasing defensive systems.

Ambassador Niles pointed out that the US proposals in Geneva reflected a consistent set of criteria which also must be kept in mind for any evaluation of the Soviet proposals:

- 1) the stability of deterrence;
- 2) the balance of nuclear forces;
- 3) the ability of both sides to modernize arsenals;
- 4) the security of the European Allies;
- 5) the capacity to verify any new agreements.

Niles addressed each of these considerations in turn.

The stability of deterrence would be seriously undermined if either side achieved a first-strike capability. The United States had never pursued such a capability, said Niles, but the Soviet Union had. Some critics of US policy had argued that, after deployment of the D-5 missile on the Trident submarine in 1989, the US would have a first-strike capability but Niles asserted that submarine-launched nuclear missiles had too many limitations to comprise a credible first-strike force. On the other hand, US negotiators were concerned that certain aspects of the Soviet proposal would strengthen the Soviet first-strike capability.

Would the Soviet proposals lead to an equitable balance of nuclear forces between the two powers? A preliminary analysis, said Niles, suggested that the Soviet Union would retain major advantages in

the numbers of weapons and warheads, in delivery vehicles, and in ballistic missile throw-weight. Throw-weight was a concept which the Soviet negotiators had never considered to be significant but which the United States considered to be very important.

The United States was also concerned that implementation of the Soviet proposals would prohibit key aspects of the US modernization program while allowing the Soviet programme, which was at a different stage, to proceed; it would allow Soviet deployment of the SS-X-24, SS-25, and the SS-NX-23*, but might prevent US deployment of the D-5 and the "Midgetman." This seeming inequity needed clarification.

US officials suspected that the new Soviet proposals were designed to further a long-term Soviet goal: the separation of the United States from its European allies, demanding the removal of US systems from Europe while in no way diminishing the threat of Soviet forces targeted on Western Europe.

Another important criterion was verifiability. US negotiators were concerned that some aspects of the Soviet proposals would not be verifiable.

The earlier Soviet pre-condition, that the United States give up SDI research, had impeded progress at Geneva, but there seemed to be some movement on this issue: Marshal Akhromeyev had hinted, in a Moscow press conference, that certain aspects of SDI research were acceptable. Niles argued that the Soviet Union had continued its own strategic defence research for the last 15 years, it believed that strategic defence could work and wanted to be the only country with that capability. The President of United States could not allow such a situation to develop. The United States had experimented with self-restraint, said Niles, in the case of the enhanced radiation weapon (ERW) and in the case of the B-1 bomber under President Carter, but whereas the United States did not proceed with deployment of the ERW, or "neutron bomb", the Soviet Union had such a bomb today. When Carter cancelled the US B-1 bomber program, the USSR did not follow suit. The Soviet Union continued the Backfire bomber programme and immediately moved on to the Blackjack programme — an aircraft which resembled the B-1 and B-1A in many respects.

* No longer in the experimental stage, the SS-N-23 is an SLBM deployed on Soviet Delta-class submarines since December 1985.

Niles concluded that, while US negotiators still had some reservations about certain aspects of the proposals, there had been significant progress in the Soviet position and there was therefore reason to be optimistic.

4. Discussion and questions from the floor

Build-down

In his presentation, Alton Frye discussed "build-down". He said that the build-down concept had been advanced in the US Congress as a replacement for the "Freeze" proposal, which, in its present form at least, was considered by most representatives to be non-negotiable. There was much more congressional support for the build-down proposal, Frye said, than for the freeze initiative, and it was this support which had contributed to the positive shift in Reagan's arms control policies. Mr. Frye supported build-down, arguing that modernization would continue as long as both superpowers maintained their right to upgrade their nuclear arsenals. Under the build-down regime the very process of modernization would result in fewer and fewer weapons and the restraints imposed by build-down could contribute to stability.

Furthermore, there had been a "progression" in the Soviet response. Frye quoted a Soviet spokesman, Georgi Korniyenko, who stated in Geneva that "anything negative" the Soviet Union had said about build-down "related only to the original formulation." Apparently, the USSR was now ready to discuss the possibility of a build-down initiative.

Closely associated with the argument for build-down had been the support for the small-scale, single-warhead missile, dubbed "Midgetman", which, Frye was quick to point out, need not be mobile. If the two superpowers did reduce their counterforce capability to 3 or 4,000 warheads with "hard-target kill capability", the level sought by the USSR, then a fixed-site, silo-basing scheme for Midgetman would be feasible; this, said Frye, would avoid the verification problems associated with mobile launchers.

Denis Healey and William Epstein objected to Frye's sanguine attitude toward build-down and Midgetman. The Freeze was still politically viable and technically verifiable, and continued to attract a great deal of public support in both North America and Europe.

Mr. Epstein predicted that build-down would be distorted and exploited as an excuse to retire old, obsolete weapons and to deploy

more accurate, less verifiable weapons. The superpowers would be glad to get rid of two or three “out-worn old Model T’s” and replace them with a “souped-up modern Ferrari”. But this was not going to bring about a safer world.

Intermediate-range Nuclear Forces (INF)

Wolfgang Behrends, the West German Ambassador to Canada, who was another panelist at the Friday morning session on arms control, agreed with Alton Frye that there had been some welcome movement in the Soviet and US positions on arms control. However, he pointed out that there was still a problem with the Soviet definition of strategic weapons, a problem which had been a major impediment to progress over the last fifteen years.

At the beginning of the SALT I negotiations in 1969, the Soviet Union had said that SS-4 and SS-5 intermediate-range ballistic missiles (IRBMs) should not be included in the SALT negotiations because they could not reach the United States and were therefore not strategic weapons. On the other hand, US forward-based systems — for example, US carrier-based aircraft and the F-111s stationed in the UK — could reach the Soviet Union, so they were strategic weapons and must be included. In order to reach an agreement, all of these “non-central” systems were excluded from the SALT negotiations.

This “concession” to the Soviet Union allowed the deployment of SS-20s as a “modernization” of Soviet intermediate-range nuclear forces (INF). The SS-20s, which were not detected by Western intelligence until deployment had begun,* were seen as a grave threat to Western Europe. In response, NATO leaders in 1979 had agreed to the so-called “two-track policy” of negotiating INF talks with the Soviet Union while preparing for the deployment of new US land-based missiles. When the INF talks broke down, the US began installing intermediate-range Pershing II IRBMs and ground-launched cruise missiles (GLCMs) in Europe.

The essential point, according to Ambassador Behrends, was that Western Europeans viewed SS-20s as “strategic” weapons because they could reach the homelands of their countries. Even the shorter-range SS-21, SS-22, SS-23 missiles could now be described

* The SS-20 IRBM was a derivative of the SS-16 ICBM, a mobile, three-stage missile prohibited under the SALT treaty. The USSR removed one stage, and the SS-16 ICBM became the SS-20 IRBM.

as strategic, since their recent deployment in East Germany and Czechoslovakia meant they too could reach Western European territory, notably West Germany. The Soviet Union had always argued that the SS-20 was a response to French and British nuclear forces, but these forces were "last-resort" weapons, not part of the NATO arsenal, and therefore had a different *raison d'être* from US nuclear weapons.

Denis Healey argued that the Soviet view, that the British and French nuclear forces should be counted along with the US arsenal, was a perfectly rational position. The Soviet proposal at Geneva suggested that, in order to maintain an overall balance, any increase in the French and British nuclear forces should be accompanied by equivalent reductions in the US nuclear arsenal.

Mr. Bykov made three points clarifying how the Soviet proposal would deal with this issue: 1) a fifty percent reduction in the Soviet and American arsenals would begin to change their lopsided relationship vis-a-vis the European forces; 2) the deep cuts proposed were viewed as the beginning, not the end, of a long-term reduction process which would eventually embrace other nuclear powers; but 3) for the time being, the Soviet Union was not urging a reduction in British and French forces but simply that, in assessing the overall strategic balance, those forces should be taken into account.

George Bell, of the Canadian Institute for Strategic Studies, pointed out that increased deployment of SS-20s in Asia would pose a threat to the northwest of North America.

Mr. Frye reminded the audience that the numbers of warheads were now so great that, even if both the United States and the Soviet Union eliminated all intermediate-range nuclear forces, every target previously covered by those warheads would still be covered by warheads from within the strategic arsenals. In other words, the total elimination of the SS-20s would not alter the threat to Western Europe. Similarly, an elimination of US INF weapons would not change the threat to Eastern Europe or to the Soviet Union.

For this reason, Mr. Frye said that he supported an integrated approach in which INF would be counted as part of an overall pool. If reductions were implemented, it would be more advantageous to retain strategic systems capable of covering the entire "target set" and to eliminate the less versatile medium-range missiles. There would be a stabilizing trend, Frye said, with the two sides relying more and more on fewer numbers of verifiable strategic systems.

William Beckett, former director of Nuclear and Arms Control Policy at the Department of National Defence, referred to the problem of defining what is, or is not, a "strategic" weapon. For example, Soviet submarine-launched cruise missiles (SLCMs) would be able to hit targets in the continental United States. Were these to be counted? Mr. Bykov responded to this question by saying that negotiations should take into account everything which was capable of reaching the territory of the other side.

Proposals for a Test Ban

Just prior to the conference, Secretary General Gorbachev had announced a Soviet moratorium on nuclear testing and had invited the United States to join before the end of 1985. Jim Stark, of Operation Dismantle asked why this unilateral initiative had met with such a "spectacular" lack of interest in the West.

Mr. Bykov said that Soviet leaders had found the lack of response puzzling. The arguments against a Comprehensive Test Ban (CTB), he said, were beginning to shift. Previously, Western negotiators claimed that a CTB could not be verified. Now the argument being put forward was the military necessity of testing in order to carry out modernization of weapons systems. Tests were said to be required so that more sophisticated weapons could be developed and deployed. This, said Mr. Bykov, brought up a point of utmost importance in any arms control restrictions: counterforce. One way to curb the development of more lethal counterforce capability was to stop the testing of new weapons.

Mr. Epstein argued that a Comprehensive Test Ban should be Canada's number one priority at the United Nations. He suggested that the United States opposed a test ban simply and solely because they wanted to test new weapons. The Allies did not necessarily agree with this position, said Mr. Epstein, but they went along with it to maintain NATO solidarity.

Mr. Frye reminded the audience that there was widespread support in the US Congress for a CTB. However, it was important to note, he said, that a CTB at this point would not prevent the deployment of new US counterforce weapons, for example, the Midgetman or the Trident D-5 missile. In spite of a Congressional push for a CTB the Reagan Administration remained opposed to a ban on testing. A compromise had been proposed which included ratification of the Threshold Test Ban (TTB) and the Peaceful Nuclear Explosions (PNE) Agreement, and a resumption of talks on a CTB with an immediate quota of no more than five tests per year for each

side. However, since US National Security advisors said tests were required in order to maintain “confidence” in the weapons inventory, Mr. Frye predicted that there was likely to be no compromise on nuclear testing for the duration of the Reagan Administration.

II.

TECHNOLOGY OF SDI AND ITS IMPLICATIONS FOR DOCTRINE

1. Introduction

Chairing the Friday afternoon session was Stuart Smith, Chairman of the Science Council of Canada, a body which makes recommendations to the government on policy regarding science and technology. He set the stage by pointing out that the new technology could have a number of purposes, depending on how well it worked. If its purpose was military, the technology had better work. If its purpose was diplomatic, as a bargaining chip for example, then "it's okay if it only has the possibility of working, so the other side thinks it's worth trading off something it has." If it was only an industrial strategy or a research strategy, then only parts of it had to work (although this may be a very expensive way of stimulating industry and/or research). Finally, if the purpose was merely political, in the everyday, vote-getting sense of the word, then none of it ever had to work, as long as it sounded good. He argued from this line of reasoning that, if we could determine how good SDI technology is, we would have a much better idea what the strategic purpose is.

Gerold Yonas, Chief Scientist of the SDI Organization, presented a brief review of the history of SDI and an overview of the technology.*

The idea of pursuing a ballistic missile defence (BMD) with an extensive research programme was first suggested by President Reagan in March, 1983. He set up two panels to study the issue and announced the formation of the Strategic Defense Initiative (SDI) in 1984, with an initial funding level of about US \$1.4 billion.

SDI is considered to be a "prudent hedge" in the face of Soviet research in strategic defence. The Soviet Union, said Dr. Yonas, would continue to be a "determined and resolute opponent". They would not make it easy; they would respond. Any US research programme must take account of possible Soviet countermeasures, in order to prepare a realistic evaluation of the feasibility of defence systems.

* For a more detailed presentation of SDI technology, see Appendix II.

2. Possible Soviet Countermeasures: The “Red Team”

Dr. Yonas told the conference that the Strategic Defense Initiative Organization (SDIO) had set up a “Red Team” whose charter it was to defeat the “Blue Team”. Their mandate was to devise Soviet countermeasures to SDI which were realistic, credible and effective. The “Red Team” had postulated a number of measures which the USSR could use to counter SDI:

- a) proliferation of boosters and warheads;
- b) hardening of the booster rockets;
- c) deployment of “fast-burn” boosters to shorten the boost phase;
- d) attacking the space-based systems with ASAT weaponry;
- e) using “penetration aids” such as chaff, decoys, and metallic balloons.

Obviously, proliferation of offensive missiles and warheads was one of the simplest countermeasures at the Soviet Union’s disposal. Hardening of the boosters had two effects:

- a) increasing the time required to destroy each missile, allowing more missiles to slip through; and
- b) suppressing “kill assessment”, that is, preventing the US surveillance system from detecting whether a target had been destroyed.

A shortened boost phase, completed before the missile left the atmosphere, would make it difficult, if not impossible, to destroy Soviet missiles in the boost phase, and thus would overload the later stages of a layered defence. Perhaps the most effective, though highly provocative, measure would be simply to attack the “sitting duck” space-based defence systems.

It was pointed out that the “Red Team”, in order to be realistic, must assess the cost of these countermeasures. For example, for deployment of “fast-burn” boosters, the “Red Team” was analyzing two classes of missiles, single-warhead and multiple-warhead, and asking the following questions: What are the effects on accuracy? On missile weight? What technical advances are required? At what cost?

3. Technical Challenges in the Face of Soviet Countermeasures

Dr. Yonas said that, in order to be judged technically feasible, a space-based ballistic missile defence (SBBMD) must be:

- a) *Survivable*: many components of the SBBMD systems would be travelling in fixed orbits around the earth. In order to be effective and reliable, these components must be able to survive an attack by the opposing side.
- b) *Robust*: the defence systems must be able to “grow” beyond the adversary’s deployment of countermeasures.
- c) *Cost Effective*: this refers to both financial and political costs. A defensive system must cost less than the adversary’s countermeasures to it. Furthermore, it must be compatible with arms control, leading to reductions of offensive forces.

The countermeasures described above presented many new technical challenges. For example, the use of decoys and chaff in the mid-course phase would lead to an increased load on “target discrimination”, requiring very rapid computer calculations and data processing. [See Appendix II for further details on SDI technology]. If these requirements could not be met, then SDI researchers would have to conclude that, over all, a comprehensive defence was not feasible.

4. Perceptions of Soviet Strategic Defence

Dr. Yonas argued that SDI research is only “prudent” in the face of continuing Soviet strategic defence activity. During the discussion of SDI, Dr. Yonas listed the following as important elements of the Soviet defence programme: air defence; the ABM site around Moscow; civil defence; ASAT weaponry; ongoing research and development into exotic technologies, such as beam weapons; and advanced surveillance and warning systems.

Special mention was made of the phased array radar network which had been deployed deep inside Soviet territory, a clear abrogation of the 1972 ABM treaty. In addition, Yonas asserted that there was evidence of a large “directed energy” research installation at Sary Shagen.

5. European Responses to SDI

It was pointed out by Ambassador Behrends that, although Western European leaders had agreed in public that SDI research was “prudent”, they were privately skeptical about its implications. There was concern that, as the United States spent a larger fraction of its defence budget on nuclear weapons and strategic defence, it would have less to spend on NATO’s conventional deterrent in Western Europe. Another worry was that SDI would be used to protect the United States, but not Europe, and that, if both the

United States and Soviet Union deployed strategic defences, they might come to see Europe as a “safe” nuclear battleground.

6. Criticisms of the Strategic Defense Initiative

Dr. Richard Garwin, senior researcher for IBM, responded to Dr. Yonas’ presentation on the technology of SDI. He said that, if the Strategic Defense Initiative Organization (SDIO) were looking into the feasibility of such a defence system, he was surprised that none of the proposals had yet been “thrown on the garbage heap.”

Dr. Garwin drew an analogy between President Reagan’s SDI and President Nixon’s “War and Cancer.” During the ten years of this politically-directed, “applied” research, ten billion dollars had been spent but little had been accomplished. In fact, the programme had probably delayed the acquisition of the fundamental knowledge which was currently proving so fruitful.

Space-based defences would be costly and vulnerable, said Dr. Garwin. Even Dr. Edward Teller, an ardent advocate of SDI, had argued against deployment in space, during testimony before congressional committees. When Dr. Garwin had been a member of the Presidential Science Advisory Committee in the 1960’s and 1970’s he had taken part in the analysis of the space shuttle programme. At that time, NASA had promised that the costs of launching vehicles and equipment into low-earth orbit (LEO), would be about \$50 per pound. The current cost was \$1,500 per pound and twice that amount for the polar orbits required for many SDI components. The kind of defence which was feasible was ground-based defence of missile silos. “We don’t do that,” said Garwin, “because it is not worth doing.” The Scowcroft Commission, appointed by President Reagan, had concluded in 1984 that protection of the US “strategic retaliatory capability” — their ICBMs — was not necessary; the “window of vulnerability” did not exist.

It was not true, said Dr. Garwin, that the United States, after signing the 1971 ABM Treaty, had decided to forego deploying the one allowed ABM installation. The United States had set-up a missile defence site at Grand Forks, North Dakota, but in 1975, that was dismantled because US planners realized that it was not worth maintaining. The United States had always been aware that the Soviet Union was carrying out research into strategic defence but the answer from the US side had been offensive countermeasures, which were cheaper and easier. For this reason, Dr. Garwin praised the SDI Organization for implementing the “Red Team” approach

in order to anticipate and explore possible countermeasures to strategic defence. The fast-burn booster, for example, would be a very effective foil for boost phase interceptors. Neutral particle beams would be rendered useless because, although they could burn through twenty centimetres of aluminum, they could not travel even a short distance through air. The earth's atmosphere would strip the electrons from the protons and the resultant charged particles would be deflected by the Earth's magnetic field. Fast-burn boosters would also pose problems for the X-ray laser, currently being promoted by Dr. Edward Teller. Dr. Teller favoured deploying X-ray lasers on submarine-launched missiles so that they could be moved up as close to Soviet missile sites as possible. The problem, said Dr. Garwin, was the curvature of the Earth. In order to attack Soviet missiles in their boost phase, the X-ray lasers would have to be launched very rapidly to clear the curvature of the Earth. This was the so-called "pop-up" mode. A rapid rise to a high altitude would require a large and powerful missile, costing much more than the Soviet missile it was intended to destroy. The shortened boost phase, attained with fast-burn boosters, would eliminate the possibility of using the X-ray laser for interception during this phase of trajectory.

There would be other consequences from Soviet deployment of fast-burn boosters. The number of space-based satellites might be increased by a factor of 30 because more warheads would survive the boost phase and would thus "overload" the mid-course layer of interception. Boosters were vulnerable to about ten calories per square centimetre, but re-entry vehicles would survive up to one thousand calories per square centimetre. Simply discussing strategic defence plans would ensure that the Soviet Union would develop and deploy fast-burn boosters. Thus, the United States was giving the Soviet Union a spur to build new, more survivable, more threatening missiles which would cost less than the kinds of missiles they were currently deploying.

Soviet mid-course countermeasures would also be cost-effective. As envisioned by SDI planners, kinetic energy weapons would fire "smart rocks" which must "hit-to-kill" Soviet warheads in space. The Soviet Union could simply deploy more warheads per missile, and smart rocks would have a hard time finding and tracking their targets against a background of nuclear explosions in space. In addition, each re-entry vehicle could be surrounded by metallic balloons attached to it by wires. "The smartest rock will choose at random and destroy one of the balloons and not the re-entry vehicle."

Instead of pursuing a strategic defence which would spur the Soviet Union to deploy more missiles and more warheads, the United States should be pursuing the security that would result from adherence to the ABM Treaty, a ban on anti-satellite and other space weaponry and a massive reduction in nuclear weapons on both sides.

7. Discussion and Comments from the Floor

Several participants argued that the claims made by the Reagan Administration regarding the current Soviet strategic defence program evaporated when examined closely. For example, it was suggested that US figures for the Soviet strategic defence budget included inflated estimates of civil defence expenditures. Furthermore, a recent CIA assessment of directed energy research, which was leaked to the press earlier this year, concluded that the United States had a five year lead over the Soviet programme.

SDI research had been supported by claims that research into these exotic technologies would provide important commercial spin-offs. Many participants suggested that this claim was unsupportable. It was pointed out by John Pike that these "technological orphans" had been wandering the halls of the Pentagon for years, unable to find a home. If the military could find no use for them, it was unlikely that civilian enterprises would.

One particularly undesirable side-effect of SDI was emphasized: the response time would have to be very rapid. In time of crisis this would mean programming the systems to respond automatically upon detection of an adversary's missile launch. Given the number of errors which occur in computerized warning systems, an automated response would be exceedingly dangerous; it could lead to an unintended nuclear war.

The following key questions were posed by participants: What does the United States want to defend, cities or silos? At what cost? Can the United States sustain that cost over time? Will Soviet counter-measures, such as deployment of many more offensive missiles, nullify any benefits of a defence system? Is it worth jeopardizing the ABM treaty to push ahead with SDI? It was acknowledged that many of these were *policy* questions which the engineers trained in investigating questions of feasibility, were not competent to address.

Charles Thomas, Deputy Assistant Secretary in the US State Department, asserted that the United States was not seeking a "leak-

proof defence”; it simply wanted to “create uncertainties” in the minds of military planners on the other side. The response to this assertion was again: At what cost? Also raised was the question of whether those same “uncertainties” might engender dangerous misperceptions and strategic instability.

Al Carnesale, Professor of Public Policy and Academic Dean at the J.F. Kennedy School of Government, Harvard, addressed the ten fundamental questions which he considered most important about the Strategic Defense Initiative. These were:

- 1) What was it?
- 2) What was it for?
- 3) Would it work?
- 4) What would it cost?
- 5) What would the Soviet Union do?
- 6) What about the Western Europeans?
- 7) How would it affect arms control?
- 8) How would it affect the risk of nuclear war?
- 9) What did morality and ethics have to do with it?
- 10) What should we do about it?

He reminded the audience that SDI was a research project investigating defence against ballistic missiles. It would not defend against bombers, cruise missiles, fishing trawlers or nuclear bombs “smuggled into our cities inside bales of marijuana”. So it could not be described as a comprehensive defence system.

What was it for? Accounts of its purpose ranged from President Reagan’s desire to make nuclear weapons impotent and obsolete, and the Secretary of Defense’s claims for a defence which is thorough, reliable and total, to the comments heard at the present conference, about a defence which simply “creates uncertainties” and complicated a Soviet attack. There was a big difference, he said, between defending our population and our military assets on the one hand, and merely complicating an adversary’s attack, on the other.

Whether SDI would work depended on the objectives. A perfect defence, one that would render nuclear weapons impotent and obsolete, was probably more an aspiration than a realistic goal. If the objective was merely to defend missile silos, that could be done with currently available technology. But was it worth the cost?

This brought Dr. Carnesale to his fourth question: What would it cost? The cost of the research programme was known, but what about the cost of deployment. "We have no idea," he said. "If you don't know what the technology is and you don't know what the objective is and you don't know what the threat is, estimates of cost are just silly."

How would the Soviet Union react? The SDI programme would stimulate Soviet countermeasures, in an attempt to frustrate or overwhelm the defence systems, of the sort outlined by Dr. Yonas. In addition, the Soviet Union would certainly step up its own strategic defence programme.

What was the Western European response? The key fact for the European Allies, said Carnesale, was that, in the forty years that the Soviet Union had had nuclear weapons, those weapons had never been used against Western Europe. For this reason, Europeans liked the status quo and were skeptical about any changes to the balance of forces in Europe. But there were other concerns about SDI. The French and the British worried that if both superpowers deployed ballistic missile defences (BMD) their independent nuclear arsenals would no longer function as effective deterrents. They also feared that, if both the United States and the Soviet Union had BMD, they might consider Europe a "safe" place for a conventional or even a nuclear war.

What would be the effect of SDI on arms control? SDI was clearly on a collision course with the ABM Treaty, a treaty which Dr. Carnesale had helped to negotiate. The conviction underlying that treaty, a conviction equally true today, was that increased defence would lead to increased offensive arsenals. Furthermore, if space-based ballistic missile defence were to go forward, there would certainly be no prospect of any kind of limitations on anti-satellite (ASAT) weaponry.

Dr. Carnesale felt that the notion of sharing the SDI technology with the Soviet Union was so patently absurd it was hardly worth discussing. During the presidential debates, Mr. Reagan had said, "This technology will work and we should share it with the Russians." Mr. Mondale had replied, "This technology won't work and it is so important, we should not share it with the Russians." Carnesale's suggested compromise: "If it works, don't share it; if it doesn't work, share it."

What would be the effect of strategic defence deployment on the risk of nuclear war? The proposed technologies would probably be more effective against a second-strike rather than a first-strike, because a second-strike would be less coordinated, with fewer weapons: the so-called “ragged response.” Thus, in a time of crisis, the existence of strategic defences would increase the “attractiveness” of going first. Carnesale caricatured the notion that defensive weaponry was stabilizing by presenting the following theorem: “There are weapons and technologies that are destabilizing and dangerous — *his*. My weapons are good”. If the Soviet Union were to start deploying a defensive system, even one designed to defend only their ICBMs, US strategic analysts would denounce it as part of their first-strike strategy and therefore destabilizing. “They might even be right.”

What did morality have to do with all of this? The choice had been presented as one between “mutual, assured destruction (MAD), or mutual, assured survival.” But Carnesale believed it was improper to put this forward as if it were a choice between alternative options; rather it was a comparison between a condition of the real world, namely that nuclear war meant assured destruction, and a *wish* that we could and would survive such a war. One was the reality, the other merely a hope.

What should be done? The most important thing, said Carnesale, was to promote a more rational debate. He summarized the polarized views on SDI which had arisen in the United States. The right said that SDI was the only path to peace; the left said that it was destabilizing. The right claimed it would enhance deterrence; the left that it was part of a first-strike capability. The left asserted that the technical requirements were impossible and that the cost would be too great; the right, that the United States could do anything and that, whatever the cost, it would be worth it. The left claimed that SDI was the death-knell for arms control; the right, that it was the rebirth. To the left it was a “cruel hoax”; for the right “a moral imperative.” None of these absolutist, polarized views could be correct.

What would Dr. Carnesale do? In his opinion, the greatest danger was the gathering political momentum behind SDI. He recommended reaffirmation of the ABM Treaty. The United States should counter potential Soviet missile defences, not by building its own defence, but through the use of penetration aids.

The problems facing the United States, Canada and the other members of the Western Alliance remained the same: dealing with the military balance in Europe; worrying about what might happen in the Persian Gulf, in the Pacific and elsewhere; and deterring a nuclear attack, *not* trying to defend against one.

8. Canada's Role in Strategic Defence

Among the questions considered at the Saturday morning session were the following: What demands would be placed on Canada if the United States decided to implement the technology and policies of strategic defence? Would the priorities of Canadian foreign policy change? Would there be deployment of some strategic defence installations on Canadian territory?

Lawrence Hagen, Research Director at the Canadian Centre for Arms Control and Disarmament, presented a paper which addressed the possibility of a radical change in US policy, moving away from a reliance on the deterrent value of mutual vulnerability, to an emphasis on strategic defence. In such circumstances, Canada's own foreign and defence policies might undergo a profound transformation. Canada's role in the conventional defence of Western Europe might have to be reduced as the defence of North America became predominant. Our role in NORAD* might develop beyond one of early warning to that of active interdiction. If space-based systems were deployed to defend against ICBMs, Canada's northern territory could become the site of installations for active defence against manned bombers and cruise missiles. There might be greater importance placed on the role of anti-submarine warfare (ASW) to deal with the threat from Soviet submarines in the north-west passage and it was also possible that some ground-based components of the SBBMD systems might have to be placed in Canada. Mr. Hagen predicted that, if any or all of these consequences occurred, Canadian defence decisions would become wholly and unambiguously dictated by US policy. This would give rise to serious political problems since Canadians are already concerned about a potential loss of sovereignty under the pressure of conflicting priorities.

What should Canada do? Of course, some US policy-makers and the supporters of SDI would welcome Canada's full participation in the strategic defence of North America. Canada should be concerned, however, because a "defence-dominant" strategic policy

* North American Aerospace Defence Command

could mean the collapse of arms control. There was little Canada could do, said Hagen, to influence the direction of American strategic doctrine, but any efforts at lobbying by Canada would be more productive if pursued immediately while the policy and programmes were still in flux. Hagen warned that the Canadian response would be hindered by the demonstrated reluctance of Canadian officials to engage in long-term analysis and strategic planning.

Albert Legault, Professor of Political Science at Laval University, responded to Mr. Hagen's paper. He said that he was more optimistic than Mr. Hagen about the future of arms control, but arms control negotiations were always played out in the context of crisis situations all over the world. Whether treaties did or did not get signed was often dependent on other events. Professor Legault cited, as examples of this, the Limited Test Ban Treaty, signed in the wake of the Cuban Missile Crisis, and the SALT II Treaty, which the United States had refused to ratify after the Soviet invasion of Afghanistan. He agreed, however, with Mr. Hagen's point that there was little that Canada could do in the competition between the superpowers.

Professor Legault characterized the Yonas/Garwin exchange over Star Wars as a debate between two priests, Yonas upholding the cult of technology, and Garwin condemning the futile search for technical solutions to what are essentially political problems. Professor Legault said that he found himself closer to the middle position put forward by Alton Frye: we could not stop research in the labs and we probably could not prevent strategic defence systems from being installed, but we must "impose a process of regulation" on this new technological thrust. Economic considerations might give rise to pressure for regulation. In 1960, the United States had possessed 40 percent of the world's gross national product (GNP), whereas now they had only 24 percent. By 2000 AD their share might be down to 18 percent. Under those conditions, neither the United States nor the Soviet Union could seriously consider dominating the world.

What was Canada to do? Legault admitted that it was going to have some problems. Canada would face pressure from the United States, but Canada had always had a remarkable capacity to withstand American pressures. If the United States developed an anti-missile defence which was purely conventional, Canadians would have to choose whether it would be better to have the fallout from interception above Canada or to ensure that interception was carried out as far north as possible?

Finally, Professor Legault maintained that NORAD represented the best political tool with which Canada could defend its interests. We would have more influence and a greater capacity to withstand US pressure from inside the system rather than by trying to argue with the Americans from the "outside."

In the course of the Friday afternoon session on the technology of SDI, John Pike, of the Federation of American Scientists, had considered Canada's role in strategic defence. His remarks and the discussion which they provoked are included in this section of the report.

Mr. Pike listed aspects of the SDI programme which might become of interest to Canada. He warned that many of these programmes were still "in flux," and that decisions concerning actual deployment would not be faced for some time. The most obvious, he said, was the High Endo-atmospheric Defense Interceptor (HEDI) which was designed to intercept re-entry vehicles just as they re-enter the atmosphere. These would be part of the "terminal layer" of defence for protecting cities. Under current SDIO planning, these interceptors would have non-nuclear, high-explosive shrapnel warheads. But if the Soviet Union deployed manoeuvring re-entry vehicles capable of evading interception, the HEDI would require an "enhanced radiation" or "neutron" warhead to ensure a kill. Pike reminded the audience that in the past such terminal defence interceptors had been equipped with nuclear warheads.

Even if Canada decided not to deploy these nuclear-tipped interceptors around Canadian cities, there were other SDI components which, according to Pike, the United States would want to deploy in or near Canadian territory. These included: aircraft for tracking re-entry vehicles, ground-based lasers, and "pop-up" X-ray lasers. [For a fuller description of SDI components which might be deployed in Canada, see Appendix II.]

In addition to these interceptors, said Pike, new sensor technologies were being developed under SDI, which could in the future be used as space-based air defence sensors providing an increased capability over present early warning technology. If Canada accepted an increasingly active role in air defence against bombers and cruise missiles, these new sensors might be of interest to Canada. In this area of space-based sensors an overlap or ambiguity would emerge between systems used for ballistic missile defence and those used for early warning and conventional air defence. This could lead to political problems, as it would be

difficult for Canada to claim that it had no involvement in ballistic missile defence.

Pauline Jewett, Member of Parliament and NDP External Affairs Critic, spoke about Canadian fears about the removal of the NORAD Agreement and its connection with SDI. As a member of a joint Senate-House committee, she had travelled across Canada taking samples of Canadian opinion on the two issues of trade with the United States and SDI. Many of the witnesses, she said, were very much concerned about preserving the ABM Treaty. Another parliamentary committee of which Ms. Jewett was also a member, the Standing Committee on External Affairs and National Defence (SCEAND), was holding hearings on the renewal of the NORAD Agreement. Ms. Jewett pointed out that a clause in the original Agreement, stipulating that Canada would not become involved in ballistic missile defence, had been removed from the agreement in 1981 by the Minister of Defence. Ms. Jewett asked John Pike whether he thought Canada could be drawn into SDI through participation in NORAD.

Mr. Pike said that it was difficult to assess exactly how significant Canada's participation might be. If SDI emerged simply as a limited programme for protecting missile silos or if SDI ended up relying primarily on space-based components, then Canadian participation might not be necessary. On the other hand, if SDI were to examine interception in the mid-course phase and/or require the survivability afforded by ground-based components, then Canadian participation could become critical to the success of the programme. It was too early to tell in which direction the SDI programme would evolve, said Pike, and thus it was difficult to predict the implications for Canada if it remained in NORAD.

John Polanyi, Professor of Chemistry at the University of Toronto, was another member of the Saturday panel who addressed the question of Canadian involvement in SDI. He took exception to Harvey Andre's statement, made the day before in his speech to the CCIL, that deterrence was the best guarantee of peace that we had in the nuclear age. On the contrary, Polanyi said, deterrence was intolerably dangerous; if we were to survive we must supplement deterrence with some other means of preventing war. Arms control was an important first step because arms control implied that the rule of law overrides the law of the jungle. Canada, as a founding member of the UN and a participant in every major multilateral forum on disarmament over the last four decades, was a country fundamentally committed to the arms control process. It was be-

cause of this commitment that Prime Minister Brian Mulroney had declined the invitation to take part, officially, in strategic defence research. The Prime Minister should be congratulated, said Polanyi, for responding to Canadians' fear that SDI would "blow the 1972 ABM Treaty sky-high."

How would Canadians regard Canada's continued involvement in NORAD which, with the advent of SDI, now straddled both aerospace and outer space, both passive sensing and active interdiction? If SDI proceeded, the United States would press for Canada's active participation in ballistic missile defence, bomber defence and cruise missile defence. It was important, said Polanyi, that Canada made its views known, politely but firmly, at this early stage.

In closing, Professor Polanyi used an analogy from the laboratory. Sometimes, he said, when you have a recalcitrant piece of delicate scientific equipment, you can save the day by giving it a bash. On 23 March 1983, that was what President Reagan had done to the delicate world of international relations. He frightened both the Soviet Union and the allies of the United States; he set in motion a process of soul-searching unparalleled since the Cuban Missile Crisis. The question now was whether this was a stroke of genius or simply vandalism.

Discussion and Questions from the Floor

William Epstein suggested that Mr. Hagen's comment, that there was little Canada could do to influence US policy, was too pessimistic. He pointed out that both Denis Healey and Abram Chayes had said that Canada could, and should, play a more active role in both NORAD and NATO.

Paul McCrae asked whether Canadians should be concerned that Soviet missiles and warheads might be "salvage-fused", that is, that the nuclear warheads would be rigged to explode if intercepted, in which case they would explode over Canadian territory. Professor Legault responded that it would be in Canada's interest to participate in missile defence to ensure that interception takes place as far north as possible. Professor Polanyi disagreed. He quoted former Prime Minister Trudeau, who had responded to the question of missiles falling on Canada with: "Who cares? What matters is whether there is a global conflagration." Professor Polanyi emphasized that Canada should oppose SDI because it increased the risk of nuclear war and diminished the security of the planet.

James Stark, head of Operation Dismantle, asked Al Carnesale why he considered disarmament an unrealistic alternative. Dr. Carnesale responded that nuclear disarmament was, in his opinion, just as unlikely as the possibility that a technological breakthrough would render nuclear weapons "impotent and obsolete." Specific options should be pursued only if they could effectively reduce the risk of nuclear war.

Anatol Rapoport, of the University of Toronto, argued that social reality was shaped by what we said and wrote about it. Thus, nuclear disarmament was only unlikely, if we believed and said and wrote that it was unlikely.

Mr. Garwin asked the participants to consider what might happen if we did achieve nuclear disarmament. Would the situation be stable? What would we have to do to protect and maintain a disarmed world? While it was acceptable to consider alternative worlds a great deal of effort was required right now to maintain the perilous security that we had.

Denis Healey agreed that what was important was preventing a war between the superpowers. Nuclear war would be made less likely by controlling the arms race and achieving security at lower levels and at a lower cost. It would involve co-operation, not just on these military questions, but on political questions as well, especially those involving instabilities in the Third World and the situation in Eastern Europe. Canada and Britain, along with other middle and smaller powers, had an interest in persuading the superpowers to co-operate. American policy, he argued, was the outcome of bureaucratic battles between Congress and the White House, between the State Department and the Pentagon. The allies of the United States could swing the tide of that battle as had happened with the recent debate over the correct interpretation of the ABM Treaty [See Section III].

Ann Adelson, a peace activist of the Toronto Disarmament Network, said that with the advent of SDI the "front-line" had changed from Europe to North America. NORAD, she said, would be integrally connected with space-based ballistic missile defence. How could Canada say "no" to SDI without saying "no" to NORAD? Mr. Hagen argued, on the other hand, that the early warning of attack was probably the most benign and valuable exercise that a sovereign state could perform. Canada's withdrawal from NORAD would be counter-productive and impossible from a diplomatic point of view.

Mr. Polanyi was disturbed by an argument, made by US officials, which was taking hold in Canada: namely, that SDI was a necessary response to Soviet research into strategic defence. He cited an article in the *Ottawa Citizen* which claimed that the Soviet Union had spent as much on strategic defence as on offensive weaponry. To support this argument, the article had said that Moscow had the only operational ABM system. Polanyi noted that the Soviet ABM system around Moscow was "virtually useless", and the same could be said of their anti-satellite system. The article went on to say that the Soviet Union had made 100 space launches last year, of which 80 were military. Professor Polanyi reminded conference participants that the United States simply did not need to make as many launches to accomplish its goals. These arguments were politically motivated, said Professor Polanyi, and people with technical background should use their expertise to counter them.

Alton Frye echoed comments made earlier by William Epstein and Denis Healey, to the effect that its allies could have an impact on the political debate within the United States. Frye argued that because Prime Minister Mulroney was seen as a kindred soul by President Reagan, he had a chance of influencing the latter. By way of example he pointed out that another "kindred soul", Margaret Thatcher, had managed to elicit a clarification from the Reagan Administration regarding the purpose of SDI, namely that its goal was to enhance deterrence rather than to escape from it. That demand had had an impact on subsequent US statements about SDI.

Dr. Stuart Smith, of the Science Council of Canada, was struck by parallels between the military and the economic aspects of the Canadian-American relationship. As America moved towards protectionism, panic ensued in Canada and it found itself with no other option but to fuse its economy with that of the United States. In the same way, the closer the United States moved towards unilateralism in its defence policies and away from multilateralism, the more it would become necessary for Canada to fuse its policies with those of our "big neighbour to the South." In that case our influence would disappear. He warned that Canada's opportunity for changing the direction of US policy would be of brief duration.

III.

SDI AND THE ABM TREATY

1. Overview of the ABM Treaty

Abram Chayes, of Harvard Law School, made the opening presentation at the session on the 1972 Anti-Ballistic Missile (ABM) Treaty which was co-sponsored by the Canadian Council on International Law. He began by responding to comments made by President Reagan's National Security Advisor, Robert MacFarlane, in a press briefing on 9 October 1985, to the effect that the ABM Treaty allowed testing of "exotic" space-based defences. Mr. Chayes quoted relevant sections of the Treaty to indicate where, he believed, MacFarlane to be wrong.

Article I of the Treaty states that "each party undertakes not to deploy ABM systems for a defence of the territory of its country . . .". In Article V the signatories promise "not to develop, test, or deploy ABM systems or components which are sea-based, air-based, space-based or mobile land-based." From these two articles, it could be seen that the ultimate goal of a space-based ballistic missile defence, designed to defend population centres and "territory", was clearly prohibited by the Treaty.

The one fixed, land-based ABM site, permitted under Article III, can, under Article VII, be upgraded and modernized. In order to carry out that modernization, Article IV allows testing of new components at a pre-arranged test site. Research is not mentioned in the Treaty, mainly because a ban on research could not be verified. Chayes pointed out that, as with all legal documents, anything that is not explicitly prohibited is implicitly permitted. In sum, the Treaty permits:

- a) *basic research* into ABM technology;
- b) *testing of components* for modernization of the one allowed land-based missile site;
- c) *modernization* of the one allowed land-based ABM site.

The provisions of the Treaty were designed to prevent "breakout" that is, to avoid the situation wherein one side has stockpiled components and suddenly catches the other side off guard, abrogating the Treaty with the deployment of a fully operational ABM system.

2. Ambiguities of the Treaty

Chayes admitted that the Treaty had serious ambiguities. Some could be addressed satisfactorily, but others continued to provide legal loopholes. He cited the following instances:

- a) anything done "under-roof" can be considered "research"; as soon as it comes out where it can be monitored, it can be considered "development and testing".
- b) the United States is testing devices for tracking and pointing in space. These devices could be considered to be ABM components because they can be used for tracking missiles or warheads in space, and for pointing beam weapons. However, representatives of the US Department of Defense argue that they are *not* components of an ABM system because: they could not, in their present form be used to attack missiles in space; tests are being conducted at a level of power and performance which is insufficient for the ABM role; and these devices are directed at satellites, not missiles.
- c) the Soviet Union has deployed phased-array radars at Krasnoyarsk, Siberia, a location deep inside their territory. Article VIb enjoins each signatory "not to deploy . . . radars . . . except at locations along the periphery of its national territory and oriented outward." Soviet leaders argue that the radars are for tracking satellites, but these installations could also be used as part of a ballistic missile defence system.

It was clear from these last two examples that both countries were pushing at the boundaries of the Treaty, trying to exploit its ambiguities.

3. Interpretation of the Treaty

The US National Security Advisor, Robert MacFarlane, had based his claim that testing of "exotic technologies" designed for ballistic missile defence was permitted under the ABM treaty, on "Agreed Statement D", one of the provisions appended to the ABM treaty at the time of signing. Statement "D" refers to testing of "ABM systems based on other physical principles." However, Agreed Statement "D" is tied to Article III, referring to the modernization of the one allowed fixed, land-based ABM. Agreed Statement D states that, if new technologies are developed, "based on other physical principles," the two parties agree *not* to proceed to the testing and deployment otherwise permitted under Article III, that is, for simple modernization using conventional technology. Rather, the country which develops these exotic technologies is obliged to

renegotiate the terms of the treaty, discussing the implications of such modernization with the other signatory. In other words, Agreed Statement D is a *further restriction* on Article III, limiting the modernization of the one fixed, land-based ABM site when that modernization is based on “exotic technologies”.

MacFarlane’s comments had elicited an outcry from the European allies, to which the US Secretary of State, George Shultz, had quickly responded. Shultz assured the allies that the United States would continue to observe the more restrictive interpretation of the treaty; SDI, he said, was nothing more than a “prudent” research programme.

Chayes summarized his analysis by pointing to two conclusions which could be drawn from these recent events. One was that research into SDI was allowed, while testing was banned. The second was that the voices of the allies could have a strong effect on US policy statements. He sounded the recurring theme, touched on many times throughout the conference, that Canada and the NATO allies should rally international support for the ABM treaty.

IV.

INFORMING THE PUBLIC

1. Getting the Information to the General Public

One of the risks of holding a conference on new technologies and their effect on strategic doctrine is that the various invited experts may lapse into a jargon ridden exchange totally unintelligible to the lay-person. There is always a danger of becoming fascinated with technical minutiae and overlooking larger policy implications. In the last session of the conference, panelists addressed the question: Are Canadians getting the information and analysis that they need to make informed and thoughtful decisions on Canadian foreign and military policies?

Canada's Associate Minister of Defence, the Honourable Harvie Andre, in a speech given the previous evening to the Canadian Council on International Law, had declared that we must get the "facts" to the Canadian people. John Sigler, Professor of International Relations at Carleton University, countered that it was not a question of presenting "facts" but of exposing the debate over how these facts should be interpreted; each proponent of a given policy should be allowed to put forward his or her arguments and the reasoning by which a particular conclusion was reached.

Christopher Wren, Ottawa Bureau Chief for the *New York Times*, admitted that he found the credentials of the members of the audience, let alone the panelists, intimidating; he reminded the participants of the danger of arms control experts talking above the head of the "man-in-the-street." The press, he said, had a key role in acting as an intermediary, asking the experts and politicians probing questions, and keeping the public informed both about the "facts" and about their implications for national policy.

John Honderich, of the *Toronto Star*, was disturbed because some sessions were "off the record".* He pointed out that the Canadian public had a right to know the strategic implications of new technologies and new doctrines. Researchers who were experts in the field very often did not have the time to communicate their arguments to a general audience. It was the responsibility of the Cana-

* The intent of CIIPS was that all participants were free to use the substance of the discussions as they wished, but that if journalists wanted to attribute comments, they should seek the permission of the participant or arrange a direct interview at the end of the session.

dian media, Mr. Honderich said, to report the various positions taken in a given policy debate, extract the key information from the experts, and make it available to the public.

Mr. Honderich argued that the media had not adequately conveyed the strategic implications of SDI to the Canadian public. He cited three reasons for this poor performance. The first was their perception of an overall lack of interest in strategic and military affairs among Canadians, although he acknowledged that this complacent attitude had been changing in recent years, mainly because the activities of "grassroots" disarmament groups were forcing these issues on to the national agenda and consequently into the media. The second reason was the secretive manner with which Canadian government officials treated these matters. He contrasted the behaviour of Canadian officials with that of their American counterparts. As a correspondent in Washington, writing about Canadian-US commercial relations, he had been contacted by the Commerce Department official responsible for Canadian/US affairs, in order to set out the conditions for a working relationship. This sort of initiative was uncommon in Ottawa. The third reason given by Mr. Honderich was the failure of journalists in Canada to find out all they could and to transmit that information to the Canadian public. He acknowledged that the actual outcome of SDI was not yet clear-cut; what was required was an ongoing "clarification of the issues." Experts should talk to journalists often, because the print and broadcast media represent the quickest most effective method of communicating with a broader audience.

2. The Problem of Government Secrecy

Gérard Pelletier, an experienced diplomat, politician, and journalist, provided a unique insight into the attitudes and behaviour that characterize representatives from each of these three fields.

Politicians, he said, tend to think that the voters are not interested in foreign policy and defence planning. However, often citizens were not interested because their political élites did not address international issues, especially during election campaigns. The reason for this, M. Pelletier suggested, was that the majority of political leaders did not know enough about these topics to feel comfortable dealing with them. It was the role of journalists to keep the important subjects of defence and foreign policy before the public, to ask participants probing questions, and to provide as much information as possible. M. Pelletier quoted Jean Monnet, who wrote in his memoirs: "In politics and in public affairs in general, what is secret

is rarely important, and what is important is rarely secret.”* It was a myth, but one that many civilians accepted, that questions of war and peace were sensitive topics to which only government officials should be privy.

In fact, according to M. Pelletier, there were very few things that political leaders knew and that citizens should not know. The “myth” that secrecy was always necessary for national security created reservations amongst the citizenry which were dangerous to democracy and to peace and security. The key facts, opinions and arguments must be made available to the Canadian people, in order for them to take part in important policy discussions.

3. Comments from the Floor

In the open discussion which followed, Anatol Rapoport, of the University of Toronto, commented that war was an institution which had become obsolete; no conceivable political goals could be realized by using nuclear weapons. In spite of this, the superpowers, as well as other nations, continued to arm themselves with nuclear weapons and continued to devise military strategies for the use of those weapons. In the formulation of nuclear strategies, an abundance of intricate problems arose and generated challenging work for hundreds of strategic analysts.

Professor Rapoport charged that the public was mesmerized by these “experts”. The primitive level of their reasoning was not apparent because the uninitiated were baffled by the jargon of defence planners. What was hidden beneath the disguise of competence and realism was a simplistic version of a zero-sum game: for one to “win” the other must “lose.” But, he emphasized, we were no longer playing a zero-sum game; in our nuclear-armed world, co-operation between adversaries had become imperative. To think about national interests and national security in the same way as did Louis XIV or Frederick the Great was both morally and intellectually irresponsible.

A response to this comment came from Christopher Wren, who pointed out that, while nuclear weapons might not be practical for war-fighting, wars fought with conventional weapons — in Vietnam, Cambodia, Lebanon, for example — were certainly not obsolete.

* French original: “En politique et dans les affaires publiques en général, ce qui est secret est rarement important et ce qui est important est rarement secret”.

In commenting on the preceding panel discussion, James Stark, Director of Operation Dismantle, began by pointing out that, although the session was entitled "Citizens and Governments," there were no "citizens" on the panel, only journalists. His second comment referred to the media's "unfair" treatment of members of the peace movement. Peace activists were criticized either for not trying to influence Soviet policy, or for being naive enough to believe that they could influence Soviet policy. Then, when the Soviet Union did do something right, such as implementing the unilateral moratorium on nuclear testing, peace groups were left looking like apologists because they agreed with this or that specific Soviet initiative. In media reports, peace groups tended to be referred to as dupes of "fifth columnists". Members of the peace movement, according to Mr. Stark, feared a reinvention of McCarthyism. Finally, he agreed with earlier comments that the conference should have been open to the media because members of the press were, in effect, an unelected political force of immense influence. However, to do an effective job, journalists must learn to pick their way through the "ideological minefield" that surrounded the arms control debate.

Mr. George Bell, of the Canadian Institute for Strategic Studies, addressed the question of government secrecy. He emphasized the difference between the Canadian system of responsible government and the American system of representative government. For example, the written mandate of the Chief of Information for the US Department of Defense is to provide the maximum amount of information consistent with national security. In Canada, on the other hand, there is an unwritten mandate to provide the minimum amount of information consistent with "Cabinet Security." Since the Glassco Commission in 1964, Canada had had inhibiting regulations governing both defence and external affairs. Mr. Bell suggested that there were many issues about which the public could, and should, be informed by government officials. For example, in the development of the North Warning System, most of the discussion on the technology, the structure and the organization involved could have been divulged to the public. Mr. Bell addressed a question to M. Pelletier: How can we get Canadian Cabinet Ministers to recognize that there is a need for public information on many of these issues?

M. Pelletier replied by reminding the audience that Canada obeyed rules which are laid down by the United States and NATO. Unfortunately, Canadian officials frequently adhered to a policy of secrecy only to find that the critical information had been leaked to the press in Washington.

John Walker, of Southam News, commented that anyone who had attended NATO conferences knew that members of the Canadian delegation would not tell journalists very much about what had gone on, whereas every other delegation would. The Canadian government, Mr. Walker said, was too secretive with its citizens. For example, the negotiations over cruise missile testing and the dropping of the clause referring to Ballistic Missile Defence (BMD) from the NORAD agreement were kept secret from the Canadian people. Government officials must move away from secrecy if they expected the citizenry to be better informed.

George Bell asked Mr. Honderich whether it was possible for the media to achieve sufficient expertise to publish information which threw light on all sides of an issue? Mr. Honderich replied that every journalist was trained to get all sides of a story. The peace groups, according to Mr. Honderich, had become particularly sophisticated in dealing with the media and getting across their point of view. Some academics had contributed to the debate by submitting articles to daily newspapers. Strategic analysts might worry that journalists would not deal adequately with their information and their point of view, but it was better for strategic analysts to present their opinions and arguments rather than leave the debate wholly to the other side.

Ms. Joanna Miller, of Project Ploughshares, commented on the seeming uniformity of the American media. There was, she said, a strong tendency among American media to parrot the position of the Administration rather than to present a probing analysis or a historical perspective. She reported that over the years she had heard many US journalists complain that there was a strong pressure to "go along", to be a "good team player", especially in the case of those assigned to the Pentagon. She asked Christopher Wren whether American reporters were under pressure to conform?

Mr. Wren emphasized the difference between print journalism and television. He said that he had chosen not to move into broadcast media but to remain a newspaper reporter, because in print there was more space for analysis and background information. In general, however, he disagreed with Ms. Miller's position: American reporters were not willing to be "good team players".

Paul McRae commented that he saw two disturbing trends in the United States: one was a movement towards military "machismo", the other was a diminishing capacity for self-criticism. Christopher Wren disagreed. Not only could one criticize US policy, he maintained, one could probably get a sizable grant to do so.

Richard Garwin pointed out that, when the Pentagon or the White House had something to say, carefully-crafted public relations techniques were used to “create the agenda” for US policy debates; the real questions were not raised by government officials because it was not in their interest to do so. Mr. Garwin asked Mr. Wren: Is there any way for journalists to move beyond the official agenda and to probe these deeper questions? Christopher Wren acknowledged that the US government set the agenda at press conferences; this was especially true of the Reagan Administration, which was far less accessible than the Nixon White House. He had no specific recommendations for overcoming this problem.

Hugh Winsor offered an explanation of why the level of dialogue on these issues was relatively unsophisticated in the Canadian press. Journalists might be under-informed, he said, but they did have a “nose for power”; the Canadian media homed in on areas where power was being exercised. The media paid less attention to the subjects addressed in this conference because of their overall perception that Canada had little or no leverage in these matters.

Mr. Winsor also touched on the contrasts between broadcast media and print journalism. He said that he understood full well one of the reasons why the sessions had been closed — to avoid the disruption of television lights. Television crews, he said, “shoot 45 minutes worth of tape and then broadcast a 45-second clip”. He agreed with Christopher Wren that print offered the journalist a chance to probe the issues, gather the background information, and analyze the arguments. Television went for visuals. Surveys showed, however, that the public got most of its information from the electronic media.

Hillary McKenzie, of *Maclean's* magazine, said that the only way to get better coverage was to open these conferences to the media. She acknowledged that radio and television were, in general, more superficial than print, but there were documentaries, such as Gwynne Dyer's *WAR* series, which developed the historical and political contexts for the current debates.

John Walker also disagreed with the decision to hold closed sessions at the conference. Geoffrey Pearson, Executive Director of the Institute, explained that the question had been debated at length by conference organizers. Some sessions had been closed in order to facilitate a candid discussion.

Clyde Sanger, a Canadian correspondent for the *Guardian* and the *Economist*, pointed out that in Canada there were no journalists (with the possible exception of John Walker) who specialized in defence and foreign policy issues. To support this contention, he pointed out that the Editor-in-Chief of the *Globe and Mail* rotated people through Ottawa every three years. Mr. Sanger said that this was a serious shortcoming among Canadian journalists. At the Carleton School of Journalism, where he lectured, he encouraged students to consider concentrating on a specific field. A related point made by Mr. Sanger was that newspapers tended to cover high-profile, "spot events", such as a skyjacking or hostage taking, rather than covering peace and security issues on an ongoing basis.

Mr. Honerich responded that the *Toronto Star* did have a defence specialist who focused on specific issues. However, he agreed with Mr. Sanger's point that, in general, newspaper reporters were not specialists. He contrasted this with the situation in Washington, where there were journalists who have covered the White House, the Pentagon and the State Department for decades. The result was that they were able to couch current issues in a much broader perspective. In response to Mr. Sanger's other point, that newspapers followed "events" rather than "trends", Mr. Honerich pointed out that disarmament activists in Canada had had some influence over recent editorial decision-making. By convincing editors that peace and security issues were of interest to a large number of people, they had prompted the assignment of journalists to cover this area in greater depth.

Ann Adelson emphasized the fact that, although the panel session was called "Citizens and Government", the discussion had centred on the role of the media. There was a gap, she said, between citizens and the government, and somehow the media had been assigned the role of intermediary. In general, governments set the agenda and the terms of debate on defence and foreign policy, and the media often simply fell into line, putting people into one or another of the defined categories. She took up a point raised earlier: many people saw these issues in terms which are different from the set agenda. Somehow, she said, those people who did not see the situation as "win/lose" but as a problem shared by all, must change that agenda.

APPENDIX I

Keynote Address
by the Right Honourable
Denis Healey,
Member of Parliament, UK
Ottawa, 17 October 1985

The subject you have asked me to talk about, in introducing this conference, is really: Can we get beyond nuclear deterrence on which many of us believe the peace of the world has rested for the last 40 years? I want to start by talking a little bit about how this whole situation developed at the end of the war, and about the problems that we face at this moment, and then put some timid but perhaps pertinent suggestions about how we might hope to escape from those problems.

I personally belong to that large group of people who believe that the post-war settlement in Europe would not have lasted 40 years without the deterrent effect of nuclear weapons. After all, the First World War was followed by the Second, despite more favourable circumstances after 1918 than we have known since 1945 when the Second World War ended with a divided Europe — divided across the middle of the most powerful country, namely, Germany. I personally believe that the existence of nuclear weapons has been one of the things which has preserved the post-war settlement for this long period.

It has not, of course, prevented wars outside Europe. Many millions of people have died in wars in other parts of the world since 1945. The latest estimate that I saw is that a million human beings have been killed in the fighting between Iraq and Iran in the last three years, which is a rather daunting figure. Some of these wars outside Europe have directly involved the great powers themselves, such as Korea, the war in Vietnam and the war now going on in Afghanistan.

Nevertheless, in spite of the fact that most of us believe that peace in Europe has depended greatly on the existence of nuclear deterrents on both sides, there is a growing feeling that the situation cannot last much longer. President Reagan has joined the nuclear disarmers in arguing that we cannot really expect world peace to be protected indefinitely by the threat of mutual destruction.

Moreover, there are growing doubts among the military, certainly on the Western side, about some of the strategies on which nuclear deterrence has been based and especially about the element in western strategy which makes the first use of nuclear weapons by the United States dependent on a strategy of flexible response, a strategy which Bob McNamara and I, just about 20 years ago, managed to persuade NATO to adopt as an alternative to the trip-wire theory which was even less satisfactory.

What I want to do, in this opening talk at the conference, is to try to put our current problems in the perspective of the history of the last 40 years, although I recognize that it is very dangerous to isolate a single aspect of the military problem from the political framework which it inevitably reflects, and I apologize in advance for leaving the sort of problems, with which ambassadors and high commissioners deal, out of the calculation I am about to put to you.

Let us get to grips with the nuclear situation.

What struck me very much, in reading some histories which have been written recently about the period, when the western allies first discovered the secret of nuclear weapons, is that the debate which took place then was very similar to that which is surrounding President Reagan's Strategic Defense Initiative. In the United Kingdom, when we first heard, towards the end of 1944, that it might be possible to produce a nuclear weapon, quite improbable people, such as Sir John Anderson and Professor Lindeman, whom most would regard as fairly right-wing by current standards, tried to persuade Winston Churchill to tell the Russians all about it, but he refused.

Some months later, in April 1945, well before the dropping of the first nuclear weapons on Hiroshima and Nagasaki, Secretary Byrnes told President Truman, and I quote his words as recounted in Truman's diaries: "The atomic bomb will allow the United States to dictate its own terms at the end of the war." This was a very strong feeling, certainly in Washington, at that time, although later the American Secretary for War, Mr. Stimson, warned President Truman, and I quote his words: "Relations with Russia could be irretrievably embittered if we fail to approach Moscow now on limiting the bomb as an instrument of war."

In fact, as we now know, spies in the United States, Canada and Britain had kept Moscow informed of the development of nuclear

weapons on the Western side, and, inevitably, because we had not told them anything about it, suspicions had become very powerful by the end of the war in Moscow. The imaginative offer of sharing nuclear knowledge in the Baruch Plan failed, and the Cold War got under way as soon as the Second World War was over.

When the so-called Cold War began, all the Red Army needed to reach the Rhine was boots. There was practically no effective conventional deterrent against an attack on Western Europe. By 1949, four years later, Western Europe had persuaded the United States to offer it protection under the American nuclear umbrella, and that has been seen as the basis of Western Europe's security ever since.

On the other hand, the West never succeeded in using the bomb to dictate terms to the Soviet Union. Indeed, Mr. Byrnes admitted, by the time he retired, that "the Russians don't scare easy".

Nevertheless, the possibility of using nuclear weapons against the Soviet Union was considered, especially in Washington. We know from the documents released under the American Freedom of Information Act that the American Joint Chiefs of Staff did make plans for nuclear attack on the Soviet Union. In 1948, the plans involved the dropping of 50 bombs on 20 Soviet cities; in 1954, 1,000 bombs on Soviet cities. Fortunately, the government in Washington never adopted these plans, even at a time when the United States had practically a monopoly on nuclear weapons. And that monopoly eroded very fast.

By 1955, 10 years after the first nuclear explosions, the Soviet Union is believed by the West to have had 20 nuclear weapons. Almost immediately after that, the Russians launched the first Sputnik, and I was able to use the occasion at a meeting in Fiuggi in Italy to persuade the Ford Foundation to give us enough money to start the International Institute of Strategic Studies. By 1960, three years after the launching of the Sputnik, the Soviet Union had not only got 300 nuclear weapons, but had also got its own Intercontinental Ballistic Missiles and a number of submarine-launched ballistic missiles.

The growth of this Soviet nuclear capability led Secretary Herter — and this is often forgotten — when he succeeded John Foster Dulles, as the American Secretary of State, to say that he could not imagine that the United States would ever use nuclear weapons against the Soviet Union unless its own survival were directly at

stake, a sentiment which was echoed by another American Secretary of State, Henry Kissinger, some 30 years later.

Yet, at that time, when Herter made this remark which cast so much doubt on the reliability of the American nuclear umbrella, the United States had literally 20 times as many nuclear weapons as the Soviet Union.

Let me now run very quickly over the situation since 1960. Both sides have presided over enormous increases in their nuclear armouries, especially in the 10 years between 1970 and 1979, during which the United States increased the number of its warheads from 4,000 to 10,000, and the Soviet Union increased the number of its warheads from only 1,800 to 6,000. As I speak to you now, so far as I know, in 1985, the United States has some 11,000 strategic nuclear warheads against 9,000 nuclear warheads in the Soviet Union. Nobody who is directly concerned with the problem denies today that the United States and the Soviet Union have effective nuclear parity. I was at a meeting two years ago, attended by Richard Perle, in which even he accepted that there was nuclear parity between the superpowers.

Yet the arms race in the nuclear field is still continuing. In fact, by 1990, unless something is done, Russia and the United States will each have 13,000 nuclear weapons, providing they observe the provisions of the SALT II Treaty which the United States has not yet ratified. If the provisions of SALT II are ignored by the superpowers, both sides will have about 20,000 nuclear warheads each.

A question which people have been asking increasingly over the last 20 years — Churchill first asked it — is: What is the point of acquiring weapons which will simply make the rubble bounce a little bit higher if there is a nuclear war?

I think the answer to that question, which has perplexed many ordinary, sensible people is this: on both sides there has been a shift from using nuclear weapons simply to deter the outbreak of war, to thinking in terms of nuclear weapons as a means of fighting a war. Indeed, the United States Administration has adopted a strategic directive which requires it to “prevail” in the case of nuclear war.

This possibility has appeared open to governments for two reasons. First of all, it is now possible, because people on the Western side were not sensible enough to ban MIRVs during the SALT I negotiations in the late sixties, to pack a lot of warheads into a single

launch vehicle. In 1945, the first bomb dropped weighed 700 pounds to produce a one-kiloton explosion. By 1972, the West had already produced a weapon which used only 11 pounds of nuclear explosive to produce a one-kiloton explosion. At the same time, both sides have found ways of making the delivery of nuclear warheads infinitely more accurate, and an increase in accuracy of 10 per cent against a hard target is equivalent to an increase in military effectiveness of well over 100 per cent.

So both sides have begun to worry because they see the technical possibility of their enemy carrying out a successful first strike against fixed bases on land. Therefore, each side has a very strong incentive to increase the number of its nuclear weapons fired from fixed bases so as to retain the ability to retaliate even against a first strike. Of course, a force which is large enough to survive an enemy first strike could also be used for a first strike against the enemy. So, as this macabre competition develops, there is increasing risk of one side or the other actually using nuclear weapons in order to pre-empt a first strike by its opponent.

My personal opinion — and this is very much a personal opinion which is rejected by most strategic thinkers, at least in government — is that the idea of a relevant and successful first strike is, in fact, a fantasy for many reasons, even with the new military technologies available.

First of all, the institutional interests on the western side — the military industrial complex against which President Eisenhower warned us (on the Soviet side, no doubt, there is a similar complex) — have a tendency greatly to exaggerate the first-strike capability of their opponent.

In 1960, I remember, when the “window of vulnerability” was first discussed, the United States Air Force told President Eisenhower that the Soviet Union had 300 Intercontinental Ballistic Missiles. The American Navy, whose interest was rather different from that of the Air Force, said that the Soviet Union had only 10 ICBMs. However, reconnaissance by satellite showed that the Russians had, in fact, 60 ICBMs at that time. Institutional competition between services to exaggerate the nature of the threat has, of course, continued ever since then.

The second thing is that both sides possess strategic nuclear forces which are not on fixed land bases. More than half the American warheads, at the moment, are on submarines which, according to

the latest CIA report, will be invulnerable to attack at least until the end of this century, in 15 years time, and there is no evidence to suggest they will be more vulnerable in 30 years time than they will be in 15 years time. Both sides also have bomber forces which present a completely different problem to a potential attacker from fixed land-based missiles.

Thirdly, according to the calculations made by the strategic theorists, which assume that any country planning a first strike against fixed land-based missiles will have to devote at least two missiles to the destruction of every target, neither side can plan on a first strike against land-based missiles without planning to explode at least 1,000 warheads. Scientists in the Soviet Union, as in the United States and Europe, have come to the conclusion that the explosion of 1,000 warheads would mean suicide even for the successful perpetrator of a first strike against an enemy's retaliatory forces. In fact, the concept of the nuclear winter, which would wipe out human life and perhaps even plant life in the whole of the Northern Hemisphere, is now generally accepted, although there is an interesting argument between scientists about how many warheads exploded over which targets under which climatic conditions will make it impossible to grow grain in Canada and even in the United States. The concept of nuclear winter, however, is now generally accepted although, in the United States, I believe some officially-sponsored studies have still to be completed.

What strikes me most, as a chap who spent six years in the army in the last war, is this: nobody since Hiroshima and Nagasaki has actually used nuclear weapons in a war situation. To extrapolate from underground tests of single weapons, in remote locations, what precisely will happen if you were to detonate 1,000 warheads against enemy targets is a very, very dangerous and precarious exercise. The big thing about nuclear weapons is that we know that they will be more destructive and dangerous to the survival of the race than any other weapons, but none of us has the slightest idea what, in fact, would happen if they were used not on test grounds but in actual war. Anybody who has been involved in world war — I am one of the last people active in politics, along with your chairman, who was so involved — will know what an enormous difference there is between real war and theoretical war.

I think one of the great problems, from which the world is suffering at the present time, is that strategic nuclear policy is decided, certainly on the Western side and, I suspect, also on the Soviet side, by a quite miniscule, tiny élite of middle-ranking bureaucrats and

staff officers who have no personal experience of war and who are subject to no effective political control. What struck me very much, looking back on the history of the last 40 years, is the wisdom shown by people like President Eisenhower who had actually been responsible for fighting a war and also understood the way in which the armed services and industrial corporations distort policy in order to strengthen their institutional interests.

I think, also, some responsibility, for the mess we are in, lies on what I might call the defence intelligentsia who developed all these brilliant, abstract theories about nuclear war. Herman Kahn really started it with his book on escalation, when he was working at the Rand Corporation. I don't want to be too rude to the defence intelligentsia because there are so many of its representatives here tonight. I am a great admirer of that old Italian philosopher, Machiavelli, who, when he was asked on his death bed to renounce Satan and all his works, replied, "This is no time to be making enemies." But I would advise those who study these matters in universities to read the moving apologies of Tom Schelling, perhaps the most brilliant of their tribe, at an IISS conference after the Vietnam War.

I am coming now to the present day after this tedious attempt to describe what has happened over the last 40 years.

What is very striking to anybody who has been practically involved in the problems, as I was as Secretary of Defence for six years in Britain in the sixties, is that the stability of the strategic balance has been pretty invulnerable to very large variations in the relative capability of the two sides. What worries me deeply is that weapons, which are now under development and, indeed, some of which are already being deployed by both sides, could upset the stability of the strategic balance as we have known it for the last 40 years. Let me point to at least four areas of development which threaten stability.

The first, which is already established, is the development of anti-satellite weapons which could destroy the enemy's ability to know what was happening — destroy the eyes and ears of the enemy.

The second is the deployment of missiles in forward areas, which will hit their targets so fast that the enemy will have to launch on warning and the decision to launch will have to be taken not by human beings but by the microcircuits of computers. If I can take a specific example, the Soviet SS-22 and -23 missiles, which have

been placed in East Germany and Czechoslovakia — two of them could wipe out the American cruise bases in Britain at Molesworth and Greenham Common within three minutes of the first, perhaps ambiguous, knowledge that they had been launched. That would not give time for anyone to consult President Reagan, never mind for him to consult Mrs. Thatcher. In fact, I doubt very much whether even the base commander would have time to be consulted if he happened to be suffering from a call of nature at the time when the first information was received.

The third worrying area is the deployment on a very large scale, currently planned and already begun by both sides, of cruise missiles which are dual-capable. You will not know, if you detect 100 cruise missiles coming towards you, whether they are carrying nuclear weapons or conventional weapons, and some of these cruise missiles, especially those which are carried on ships or, even more, in submarines, are very easily hidden and present problems for the arms controllers of an order of magnitude greater than any which arms controllers have had to face in the past.

The fourth worrying area is the attempt by the United States, and some would say the attempt already begun by the Soviet Union, to develop strategic defence against nuclear missile attack. That leads me to the question of the Strategic Defense Initiative.

In 1983, President Reagan made a very sensible statement. He said that it is very important for the world to get away from mutual-assured destruction as a basis of its security. In other words, he wanted to replace nuclear deterrence as the basis of western security. He offered the hope, at that time in that speech, in March 1983 I think it was, two and a half years ago, that it might become possible to protect not only military targets but civilian populations against strategic nuclear attack, although he didn't point out, of course, that the sort of system he was thinking of would give no protection in itself against attack by cruise missiles or against aircraft. Given the inability of the American Air Force to prevent aircraft from Central America crossing the American frontier carrying drugs, one has some grounds for being worried about this particular loophole in the theory of total defence.

What I think has become evident, since he made that speech and since the American administration committed itself to the Strategic Defense Initiative, is that it is certainly impossible, at least in the medium term — by which I am talking about the next quarter of a century — to provide defence for civilian populations against nu-

clear attack. Some of your guests will be deploying these arguments, notably Dick Garwin, at the meeting tomorrow.

What is now proposed is to try to deploy, within about 10 years, a system which will give at least partial defence for American land-based nuclear missiles against a Soviet first strike. This intermediate objective is described by the State Department as enhancing deterrence, a very, very important shift of objective indeed.

I am personally a bit perplexed, or, at least, I would be if I had not been Defence Minister, by the United States' attempt to protect its land-based missiles by this extraordinarily expensive system of strategic defence, when it would be so much cheaper to follow the advice of the poet and put those missiles out to sea "where the real estate is free and they are miles away from me." As a politician, I know very well that the American attachment to the Triad is based basically on inter-service rivalry. The Air Force is not prepared to concede advantage to the Navy, although the CIA has told us all, that, while ICBMs are vulnerable now, there is no sign that submarines will be vulnerable in the foreseeable future.

I can understand the rationale of SDI in making that part of the American Triad less vulnerable to a Soviet first strike, but the trouble is, as I suggested earlier, that the Russians are bound to fear that the real purpose of SDI is to protect the United States missiles against a ragged response from Soviet missiles after the United States has carried out a first strike. The CIA has told us all, through the helpful mediation of the American Congress, that the Russians will have a serious window of vulnerability in about 10 years time when the Americans have the D-5 submarine-based missile, the MX missile and Midgetman in place and also, hopefully, some sort of defence against attack on the American ICBM force.

I discussed this issue recently with a leading American politician who was visiting Britain, and he said, "But this is really ridiculous. Why should the Russians fear this?" Of course, the Soviet fear is exactly the mirror image of a fear which has fuelled American defence policy for the last 20 years. Of course, if they want to, the Russians can point to Secretary Weinberger telling the Congress a few months ago, and I quote his words: "If we can get a system which we know can render their weapons impotent, we could be back in a situation where we were the only nation with a nuclear weapon." I think that prediction is nonsense, but it has been made by the American Secretary of Defense. The Russians have read the documents about American plans for strikes on the Soviet Union in

the period when they had a monopoly and can be forgiven for being worried that a future American administration might not be so cautious as the Truman and Eisenhower Administrations.

I think the only conclusion one can draw from this is that the Soviet government will spend anything which is necessary to frustrate the Strategic Defense Initiative, especially by increasing its offensive strength by the deployment of very many more and very many new weapons, as the United States is also planning to do, whatever happens to the Strategic Defense Initiative.

We have precisely the very unstable situation facing us which President Reagan referred to in his speech in 1983, when he warned against the risk that there might be a long period in which both sides were increasing both their offensive and defensive weapons. Of course, this is the reason why the last three American Presidents of all parties have opposed the Strategic Defense Initiative and at least three of the last four American Defense Secretaries — Mel Laird, so far as I know, has not yet expressed a view, but that suggests he doesn't agree with the present administration and Bob MacNamara, Harold Brown and Jim Schlesinger have all very strongly opposed it.

Now, this is the situation we face. Let me try to offer some thoughts about how we cope with it. I think the first thing which I am forced to conclude is that, in the area of arms control negotiation, the most important thing is to stop the arms race by finding some means of halting the modernization of nuclear forces; in other words, to go for some sort of freeze on the testing and deployment of new systems, both offensive and defensive. This was a thought which Mr. Gorbachev expressed in his interesting interview with *Time Magazine* a month or so ago. I think the means of freezing the arms race are readily available. Practically every government which has looked at the problem of the modernization of the nuclear component in strategic forces agrees that you could do that through having a comprehensive ban on nuclear tests. A good deal of work, I think, has been done by Canadian seismologists to suggest that you could reduce the size of a nuclear explosion which could be carried out without observation down to at least a kiloton, which is not much higher than you can produce through conventional weapons anyway.

Secondly, the means at the disposal of both the Soviet Union and the United States for photographing what is happening — both of them claim they can photograph car number plates from satellites

and, on top of that, you have electronic intelligence-gathering satellites which give you a whole range of other information about what the other side is doing — suggest that you could actually observe any tests of new weapons which were being carried out by either side. In fact, the American Defense Department admitted this when it published a list of about a dozen tests it was planning to carry out in connection with the SDI programme because it knew that the Russians could observe them, so they thought they might as well own up in advance. Of course, the Americans are always telling us that they have observed what the Russians are doing in this field as well.

My feeling is that it is very much easier to detect the development and, even more, the deployment of a new weapon, than to tell whether a particular existing weapon you have observed comes within permitted arms control ceiling. From the verification point of view, it is much easier to verify a freeze than a limitation on weapons.

If you could get some sort of ban on the modernization of weapons, then I think it would be easier for both sides to agree to reduce their existing forces to levels which no longer posed even a putative threat of a first strike. I think the Soviet suggestion of a 50 per cent cut in existing arsenals, with some adjustments, would probably serve in this area.

My own feeling about the latest Soviet proposal, so far as I know it — and we still rely, in the first place, on leaks from Washington and then on Soviet attempts to correct mistakes in those leaks — is that the new Soviet proposals offer a sensible basis for negotiation, although I think very hard negotiation will be needed on the point at which you cut off the modernization on both sides and, secondly, on which weapons are included in the various categories, particularly whether you include long-range theatre nuclear forces such as the SS-20 and the Cruise and Pershing missiles, and, of course, very difficult negotiations will arise on precisely what particular weapons are included in each category you are discussing.

My own feeling is that the sensible approach to this — though it is so obvious that governments will never accept it — is that, if you agree in principle on the sort of limitation of warhead numbers which both sides are suggesting, the sensible thing would be to allow your opponent to decide where the cuts should come, because he knows what worries him. It is the worry on each side which is the main cause of war. Perhaps your Institute might give some thought to

this idea of developing a negotiating model, in which the other side decided what is cut instead of you deciding.

The one thing I do feel is that, if you look at the Soviet government and the American government at the moment, both of them would gain immediately by the sort of agreement I have discussed. The Americans claim that the Russians are already far ahead in anti-satellite weapons and in strategic defence. I ignore, for the sake of argument and for common sense reasons, the argument used by President Reagan that the Russians are ahead in every category of strategic nuclear weapons.

On the other hand, the Russians will gain very much because they know very well that, if the arms race continues, the Americans, according to the CIA, are well ahead in most of the new technologies which are relevant; they also have an enormous economic interest, if Mr. Gorbachev wants to improve the performance of the Soviet economy in making more available for consumers, so that skilled workers have something to spend their extra wages on, rather than pouring their money into new weapons.

I finish, if I still have time, Mr. Chairman, by a few words, but they can only be very few, about the effect of the sort of agreement I have been talking about on the security of America's allies. I speak as an ally who has some experience in this field and who is deeply involved at the moment in trying to judge the political consequences, rather than the military consequences, of the operation which I have been discussing.

First of all, there is no question — there is much evidence of this from recent meetings of the NATO Council — that America's European allies are much more worried about continuing the arms race and, particularly, deploying some sort of strategic defence than they are about the consequences of stopping it. Now that the American Congress has fallen out of love with defence spending — and we look forward to a period, perhaps of many years, in which defence spending will have to be kept level in real terms, perhaps even in nominal terms, as the Congress hopes — if the United States persists in continuing the nuclear arms race, it will have to make very heavy cuts in its conventional forces and in the forces which are mainly devoted to protecting its allies. Indeed, General Rogers himself has already given warnings on this point, as has Lord Carrington as the Secretary General of NATO.

The allies are also going to have to face some very unwelcome problems. Even without an arms agreement, confidence in the strategy of flexible response, which we adopted 20 years ago, has pretty well collapsed. One reason is that, for various reasons, partly technical and partly political, nobody really believes that you can control a nuclear war once the first nuclear weapon is used. General Rogers has made this point as the Supreme Allied Commander in Europe.

Secondly, there has been no agreement within the Alliance, since McNamara and I first persuaded them to adopt the strategy of flexible response, about how to operate it. We could not even agree on the first step of the nuclear "ladder of escalation". Indeed, the Atomic Demolition Munitions (ADM), which were supposed to be the first step, are now being withdrawn from Europe because nobody could see any use for them or, if they could see a use, it was not one on which the Alliance could agree.

The third reason is also very important humanly, and that is that nobody, to my knowledge, since the war, has believed that the Russians were likely to launch a general attack out of the blue on NATO forces in Europe. But, there has been a very justified worry ever since the war that fighting might break out between NATO and East European forces as a result, perhaps, of an explosion in Eastern Europe, such as the rising in Berlin or Hungary, or the troubles in Poland or Czechoslovakia, or perhaps because of troubles in the Third World such as in the Middle East, which might spread like wildfire without real control by governments. In such a situation deterrence, by definition, is irrelevant. The fighting has started, and the question then is how you limit it without using nuclear weapons.

The big question which the allies have to face is, first of all, getting away from almost immediate use of nuclear weapons, which is implicitly current NATO strategy, to no early use, then, hopefully, to no first use of nuclear weapons, and, finally, to a strategy which depends on a non-provocative conventional deterrent and does not involve the use of nuclear weapons at all. I think, myself, that such a strategy is possible even within the economic constraints which are inevitable for the West, given our democratic systems. I have lectured at the invitation of the American National Defense University and the NATO Defence College on this, followed, I am glad to say, rather than preceded, by General Rogers.

If you are really worried about stopping war in Europe and if, as I believe, neither side really wants to use war as an instrument of policy in Europe, there is a lot to be said — and I said this before Mr. Gorbachev — for thinking about, in the medium term, some sort of co-operation between NATO and the Warsaw Pact on how you control the situation in Europe.

The real problem, I think, is a political one and that is that 40 years dependence in Europe on American nuclear protection has corrupted European thinking about defence. The European countries no longer really think about it seriously at all because they have no direct responsibility.

If I can quote two little apophthegms, if that is the right word to use: first of all, the Healey theorem which I developed when I was Defence Secretary 20 years ago, which is that it only takes 5 per cent credibility of American nuclear retaliation to deter the Russians, but it takes 95 per cent credibility to reassure the allies. Almost the whole of the strategic argument inside NATO has been about reassuring the allies rather than deterring the Russians. That is the Healey theorem.

The American answer to that, which an American friend of mine once put to me, is the American feeling about their allies that, if you scare them, they go crazy and, if you don't scare them, they go fishing.

I think that America's allies — and this includes, if I may say so, Canada as much as the European countries — now have a responsibility to think much harder about defence policy and to adjust their own defence programmes so as to produce an effective conventional deterrent against possible attack and a conventional response to a war which may break out for reasons to which deterrence is totally irrelevant.

Our other great obligation, I think, is to try to think this problem through so as to exercise some real influence over American policy, and, at the risk of losing any friends I still have in this room, I would try to make this point. My experience, watching and being engaged very often in negotiations with the United States, not only on defence issues but on economic issues, is that, if America's allies ever reach agreement on a clear, collective view, they can nearly always swing the battle in Washington. First of all, the United States' political system is by far the most porous and open to external influence in the whole of the Western World, and, secondly, Amer-

ican policy is developed through a sort of permanent great power conference between the political interest groups in Washington, notably the State Department, the White House and the Department of Defense. If the allies have a clear, collective view, they can nearly always swing the argument in their favour. We had an example of this only in the last week. Mr. McFarlane had made a statement which very much worried the allies about re-interpreting the ABM Treaty so as to permit the testing and even deployment of a strategic defence system, but allied protest led Mr. Shultz to win that battle and to be able to make a statement in San Francisco a few days ago, in which McFarlane was thrown out of the window, at least for a few days, and loyalty to the ABM Treaty was re-established.

Perhaps that is the one point on which I should end. Too often, I think, we tend to look on these problems from outside and to feel that ignorant armies are clashing by night and we are only the victims. The fact is that, in the Western system — I wish some time it might be true of the Eastern system — it is possible for allies who are trusted in Washington to have a very important influence on American policy, providing they carry their share of the can and providing they are united. One of the reasons why I was so glad to come here, in the interstice of a fairly busy life, is that your Institute and this conference are intended, I hope, to try to produce this type of influence.

APPENDIX II

The Technology of SDI

Excerpted and condensed from “The Technology of the Strategic Defence Initiative”

A conference paper submitted
by John Pike
Associate Director for Space Policy,
Federation of American Scientists

US President Reagan's National Security Study Directive (NSSD) 6-83, signed 18 April 1983, invited two study groups to identify the technological requirements and strategic implications of a defence system which would, in the President's words, “render nuclear weapons impotent and obsolete.”

The Fletcher Panel

The first study group, the Defence Technologies Study Team (known as the *Fletcher Panel* after its head, James Fletcher, former administrator of NASA), examined the technological implications of such a defence system. The Fletcher Panel recommended the development of a *layered defence* which would attempt to intercept missiles and their warheads at all four stages of the ballistic trajectory.

The four phases of the ballistic missile trajectory are:

- 1) *Boost Phase* — The initial stage, just after launch, during which the missile's rocket motors are firing; for an ICBM, this phase lasts 3-5 minutes, and the missile reaches an altitude of about 200 kilometres before powered flight ends.
- 2) *Post-Boost Phase* — The second stage; the booster rockets have ceased firing and have fallen away, the “bus” continues travelling outside the atmosphere and begins to release the missile's warheads; this phase lasts 8 to 10 minutes.
- 3) *Mid-Course Phase* — The third and longest phase of trajectory; the missile's warheads have all been released and are travelling independently through space; this phase lasts 20 to 25 minutes.
- 4) *Terminal Phase* — In this final stage the warheads, housed in “re-entry vehicles (RVs), begin to re-enter the atmosphere at an altitude of about 100 kilometres; this phase lasts only about 30-100 seconds.

The Fletcher Panel argued in favour of a 'layered defence' because of its effectiveness. Two layers, each capable of intercepting 50 per cent of the targets, would together intercept only 75 percent of the total warheads; four such layers would intercept almost 95 percent of the warheads. Since each layer would use different types of sensors and interceptors, the defence as a whole could be less vulnerable to countermeasures.

The Hoffman Panel

The second study group, the Future Security Study (known as the *Hoffman Panel*, after its head Fred Hoffman), assessed the strategic implications of new defence systems. The panel was not optimistic about achieving a reliable defence of the American population in the near term. However, it did identify a number of applications for "intermediate" defences, especially the potential for Anti-Tactical Ballistic Missile (ATBM) defences in Europe, and recommended major investment in this area.

The Strategic Defense Initiative Organization

Following these two studies, President Reagan consolidated over 30 pre-existing missile defence-related programmes into five major programmes which form the Strategic Defense Initiative Organization (SDIO). These are:

- 1) Surveillance, Acquisition, Tracking and Kill Assessment (SATKA)
- 2) Directed Energy Weapons (DEW)
- 3) Kinetic Energy Weapons (KEW)
- 4) Battle Management System
- 5) Support Programmes

I. SATKA — Surveillance, Acquisition, Tracking, and Kill Assessment

A) *Definition of Terms:*

- a) *Surveillance*: to continuously monitor likely missile-launch locations and regions in space where those missiles and their warheads are likely to pass.
- b) *Acquisition*: to discriminate warheads from background 'noise' and decoys.
- c) *Tracking*: to determine precise location and trajectory of each warhead; this information must be frequently

updated for assignment of interceptors; tracking methods also contribute to discrimination of warheads from decoys.

- d) *Kill Assessment*: to determine whether a target has been destroyed; contributes to further discrimination of warheads from decoys.

B) **Research Activities:**

- 1) **Technology Base**: to develop the data base and sensor technologies:

- a) *Radar Discrimination Project*: to collect and interpret radar signatures of missile components and re-entry vehicles; to develop new radar hardware and signal processing software.
- b) *Optical Discrimination Project*: to collect and analyze optical and infra-red data on background phenomena and signatures of ballistic missile components.

- 2) **Advanced Development**: a number of projects leading up to the demonstration of key components of advanced sensors.

- a) *Imaging Radar*: to demonstrate, by the early 1990's, a spaced-based phased-array imaging radar that can monitor ballistic missiles in the boost and post-boost phase, improving discrimination of warheads from decoys.
- b) *Imaging Laser*: to demonstrate, by the early 1990's, an imaging laser radar (LIDAR) that could also improve target/decoy discrimination.
- c) *Improved Sensors and Technology*: to develop technologies associated with advanced infra-red sensors, including optical mosaic sensors, multi-colour focal plane arrays, and cryogenic refrigeration systems.
- d) *Common Technology and Architecture*: to develop "hardened" computer circuits, signal processor architecture and software which will be common to all SDI sensors.

- 3) **System Demonstrations**: a program for realistic testing of actual prototypes.

- a) *Booster Surveillance and Tracking System (BSTS)*: improved versions of present generation early warning satellites; enhanced mid-wavelength infra-red sensing will provide higher resolution and precision for tracking missiles in their boost phase.

- b) *Space Surveillance and Tracking System (SSTS)*: uses cryogenically-cooled, long-wavelength infra-red sensors to detect and track warheads and decoys during the mid-course phase; will be able to discriminate targets from decoys based on only slight differences in their thermal signature.
- c) *Airborne Optical Systems (AOS)*: a modified Boeing 767 that will carry two mid-wavelength infra telescopes for tracking and identification of warheads in the mid-course and terminal phase.
- d) *Terminal Imaging Radar (TIR)*: a long-range, X-band radar to enhance target/decoy discrimination during terminal phase, in support of the High Endo-atmospheric Defence Interceptor (HEDI) [see KEW].

II. Directed Energy Weapons (DEW)

A) **Definition**: "directed energy" refers to weapons which use a stream of sub-atomic particles or electromagnetic radiation to attack and destroy the target. DEW are planned for use against ballistic missiles in the boost phase and post-boost phase of their trajectory.

B) *Research Activities*:

- 1) **Space-based Laser System**: includes the following components:
 - a) a deuterium fluoride (D_2F) infra-red laser which must be able to generate 5 megawatts of power for space tests;
 - b) a telescope for tracking and assigning the target missile;
 - c) a mirror, four metres in diameter, to direct the laser beam at its target.
- 2) **Ground-based Laser System**: consists of
 - a) excimer and free-electron lasers (FEL), producing beams of shorter wavelengths (visible and ultra-violet), to be installed on the ground;
 - b) space-based relay mirrors to direct the laser beams to their targets;
 - c) computerized optical technologies which are designed to compensate for distortion of laser beams as they travel through the atmosphere.

- 3) **Space-based Neutral Particle Beam Weapons:** a high-power accelerator of neutral hydrogen particles is scheduled for demonstration in space by the early 1990's. The state of development of this technology lags behind that of space-based lasers, but is on a par with other directed energy weapons and with space-based kinetic energy weapons.
- 4) **Nuclear-Driven Directed Energy Weapons (X-Ray Laser):** a prototype of the Advanced Tracking and Pointing (ATP) device, to be used with the nuclear-driven Excalibur X-Ray Laser, will be assembled and tested in space. Research on the Excalibur device itself is being conducted by the Department of Energy.

III. Kinetic Energy Weapons (KEW)

A) **Definition:** kinetic energy weapons use projectiles to destroy their targets, either by direct collision ("hit-to-kill") or through the use of explosive warheads. These weapons are being designed to intercept ballistic missiles and their warheads in all phases of their trajectory.

B) *Research Areas:*

1) **Technology Base:**

- a) *Endo-atmospheric Non-Nuclear Kill Technology:* a project to develop the means to intercept warheads as soon as they enter the atmosphere, in a terminal layer of defence. Weapons of this type might, for example, be equipped with heat-seeking, explosive warheads. They would be applicable not just to strategic defence but also to an Anti-Tactical Ballistic Missile (ATBM) defence of Europe, used against Soviet theatre nuclear forces (TNF).
- b) *Exo-Atmospheric Non-Nuclear Kill Technology:* this type of weapon system, using direct collision to destroy a target in space, would further develop the "hit-to-kill" technology initially demonstrated in the Homing Overlay Experiment (HOE) (10 June 1984).
- c) *System Engineering:* this project will develop the interceptor guidance, control, and propulsion technologies.

- 2) **Advanced Development:** projects to develop new technologies, eventually leading to prototype demonstrations.
 - a) *Hypervelocity Launcher Project (Electromagnetic Railgun):* the demonstration of a ground-based electromagnetic launcher is scheduled for the late 1980's. This "anti-missile gatling gun" will be designed to propel miniature projectiles to very high velocities and at very high rates of fire.
 - b) *Novel Concepts Project:* other kinetic energy weapon concepts that may offer advantages over existing concepts are being examined and tested. For instance, the GEDI concept involves the use of lasers to propel small projectiles to the very high velocities needed to destroy missile or warhead by impact alone.
- 3) **Systems Demonstrations:** involve projected demonstrations of a number of prototype, or pre-prototype, interceptors:
 - a) *High-Altitude Endo-Atmospheric Defence Interceptor (HEDI):* HEDI, a large, long-range, ground-based rocket interceptor equipped with a heat-seeking, explosive warhead, is scheduled to be demonstrated by the end of the decade. It is designed to intercept re-entry vehicles (RVs) as soon as they enter the atmosphere. However, if an opponent deployed manoeuvring re-entry vehicles (MARVs), HEDI would require a nuclear warhead to ensure destruction of the target.
 - b) *Exo-Atmospheric Re-entry Vehicle Interception System (ERIS):* ERIS, scheduled for demonstration at the end of the decade, is a follow-on to the Homing Overlay Experiment (HOE). It will be equipped with a heat-seeking, hit-to-kill projectile which will intercept its target outside the atmosphere. In order to reduce the cost of defence relative to offense, development of a much smaller kill vehicle is required; this miniaturization will represent a major technological challenge.
 - c) *SLBM Boost Phase Engagements:* this project will demonstrate a sea-based or air-based system for intercepting submarine-launched ballistic missiles (SLBMs) during the boost phase.
 - d) *Space-Based Hypervelocity Launcher Development:* demonstration of a space-based electromagnetic launcher is scheduled for the early 1990's. The system, using hypervelocity miniature projectiles, will be applicable to both boost phase and mid-course phase defence.

- e) *Space-Based Kinetic Kill Vehicle*: this is a space-based, rocket-propelled interceptor system of the type proposed by the High Frontier organization. These interceptors, comparable in design to the ground-based ERIS, are scheduled to be demonstrated in the early 1990's and are applicable to both boost and mid-course phases.
- f) *Terminal System Demonstrations*: this demonstration will integrate the HEDI interceptor with the Terminal Imaging Radar and the Airborne Optical System described earlier. (See "Surveillance")

IV. Systems Analysis

- 1) **Battle Management/Command, Control and Communication (BM/C³)**: researchers involved in this project are seeking to develop the elements which will link the various weapons and sensors together into an integrated defence system including:
 - a) computer hardware which is reliable and "fault-tolerant";
 - b) software to integrate command the control of the entire defence system;
 - c) procedures for the correct release of weapons, avoiding false release or false withholding;
 - d) communications networks that will be robust and secure in the presence of jamming, attack and nuclear side effects.
- 2) **Systems Architecture**: in this project, analysts will define the combination of sensors, weapons, BM/C³ systems, and supporting technologies needed to meet mission requirements. Over the next two years (1986-1987), a number of System Architecture Studies will analyze Soviet threat models, including specific countermeasures to proposed US defence systems.

V. Support Programs

The development of SDI will require a number of supporting technologies.

Research Activities:

- 1) **System Survivability:** many advocates of SDI, including Edward Teller, question whether space-based systems can be made survivable. The System Survivability Project will work on:
 - a) Soviet Threat definition;
 - b) survivability architectures;
 - c) satellite hardening;
 - d) passive and active countermeasures, including 'shoot-back' capabilities.
- 2) **Space-based Power Generation:** the primary focus will be on nuclear reactors, although chemical and magneto-hydrodynamic technologies will also be pursued. Power level requirements range from a few kilowatts for passive infrared sensors to tens or hundreds of Megawatts for particle beam weapons.
- 3) **Space Logistics:** this project could include the development of a heavy-lift launch vehicle for placing platforms of over one hundred thousand kilograms into near-earth orbit. SDI may also require the capability to service a variety of space-based 'assets', and to transfer satellites from one orbit to another, including a shift from low orbit to high orbit.

SDI Technologies of Interest to Canada

There are specific aspects of SDI which would be of particular interest to Canada. Should Canada elect to participate in the deployment programme, there are several ABM components which could be deployed within Canadian territory. There are other ABM components with technical characteristics such that basing in Canada might be required in order to enhance the defence of the United States. In addition, there are several types of space-based sensor technologies which might affect Canada's role in North American air defence.

Since SDI is in a state of rapid flux, this is merely a "snapshot" of the possibilities for deployment on Canadian territory. It is meant as a starting point for the policy debate which is sure to develop as the SDI programme unfolds:

I. ABM Components which might be deployed in Canada

The bulk of US ballistic missile defence systems, as presently defined, would be deployed in space or in the territory of the United States. There are, however, components designed for the late-midcourse and terminal layers of defence which would need to be deployed nearer the areas to be defended. These components might include:

- 1) AOS — Airborne Optical System
- 2) TIR — Terminal Imaging Radar
- 3) HEDI — High-altitude, Endo-atmospheric Defence Interceptor.

For optimal tracking of Soviet Warheads, AOS might, at the very least, need to fly regularly over Canadian air space. In addition, forward basing at Canadian air fields might be required for a rapid response to any warning of Soviet nuclear attack.

(For a description of AOS and TIR see page 60 of this Appendix; for a description of HEDI see page 62.)

II. Components Which Might Require Basing in Canada

- 1) Ground-based laser
- 2) X-ray laser (nuclear-driven), e.g., Excalibur
- 3) Exo-atmospheric, non-nuclear, hit-to-kill technology, e.g., Braduskill
- 4) ERIS — Exo-atmospheric Re-entry vehicle Interception System.

Ground-based lasers would need to be based as close to the Soviet Union as possible, in order to reduce the number and size of the space-based relay and mission mirrors, so Canada might be the logical site. The nuclear-pumped X-ray laser (Excalibur), deployed in the “pop-up” mode, would also have to be based as close to Soviet missile silos as possible, either on submarines or far to the north in Alaska, Northern Europe, or Canada.

Braduskill is a kinetic energy, hit-to-kill interceptor, which, instead of intercepting in a head-on collision, will fly along beside its targets so that it has time to discriminate between warheads and decoys. The warheads are then attacked by small rockets (sub-munitions) with explosive warheads. This interceptor would also benefit from forward basing in Canada.

Forward basing of ERIS (see page 62 of this Appendix) in areas such as Alaska or Northern Canada would permit the engagement of targets throughout the mid-course phase, rather than just the last 2,000 kilometres of mid-course flight. This would have the effect of adding additional "layers" to the defence without the need for vulnerable basing in space.

III. SDI Sensor Technologies Which Might be Applicable to Canada's Air Defence Mission

The Strategic Defense Initiative programme includes new space-based sensor technologies which could significantly improve the capabilities for tracking Soviet bombers and cruise missiles. These are:

- 1) Imaging Radar;
- 2) Infrared sensors and Data Processing;
- 3) Space Surveillance and Tracking System.

(These are described on pages 59 and 60 of this appendix.)

Because this would be an area of obvious overlap between space-based ballistic missile defence and air defence against bombers and cruise missiles, it might become very difficult for Canadian officials to argue that participation in NORAD would in no way involve Canada in anti-ballistic missile (ABM) defence systems.

APPENDIX III

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